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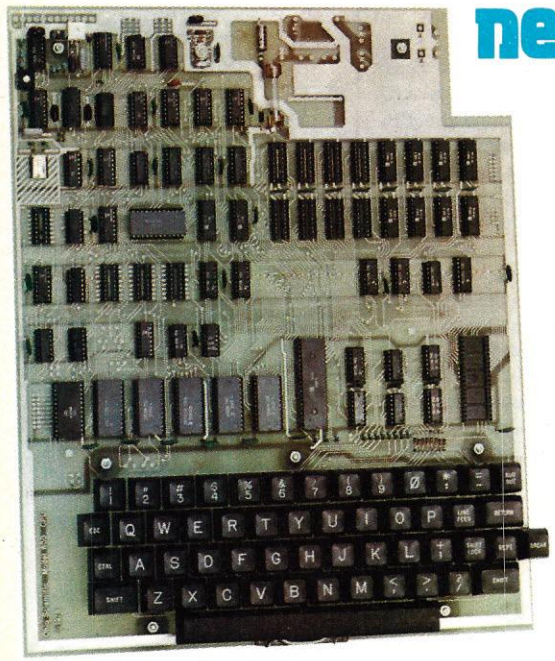

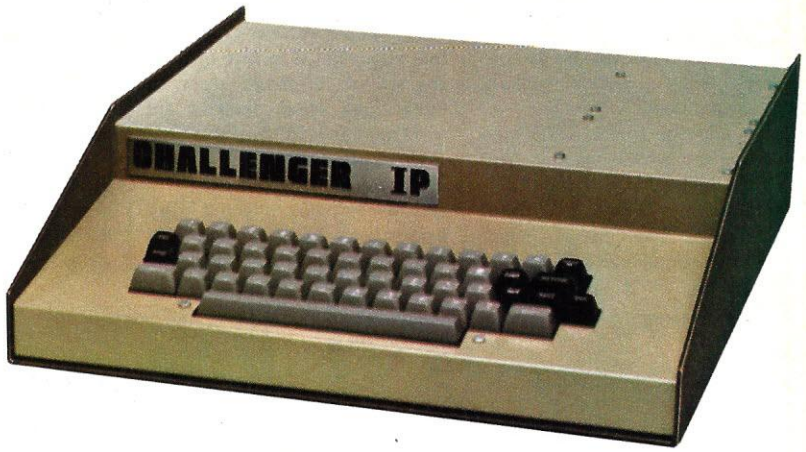

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PUBLISHER'S REMARKS

Wayne Green

New Products

One of the real eye-catchers at the Philly show was the new Southwest Tech terminal. They are now using a Cherry keyboard, and the terminal has enough smarts so it should be able to work with a system without loading it down.

In addition to the SWTP terminal, the photos on this page show new systems from Exidy (the Sorcerer), Imsai (VDP-42) and Xitan (The General), which were also on display.

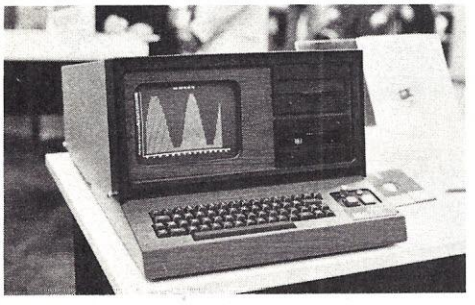
Business Applications

With more and more of the microcomputer systems obviously aimed at small-business applications there is a growing need for reviews of these systems from that viewpoint. I'm sure that the readers of *Kilobaud* want to know how these systems are working out in business environments, what software is available . . . particularly in systems software, utilities, disk operating systems, etc. Individuals or dealers who have put together packages for business use should let us all know how they did it.

It is not all that easy to round up all of the software for a business system. How much systems software is actually needed? Where do you find business software? There are several packages being advertised, but I have yet to get a really enthusiastic report on any . . . so if you have an intimate knowledge of a package that really does the job, please let us know about it.

Some months ago we did a write-up of Infotecs and their hardware-software system. They have since doubled their plant capacity, laid on a mobile demonstration unit, and have been written up in the papers and business magazines. Their sales will be over $5 million for this fiscal year! They have been showing clearly that a good microcomputer system for a specific type of business will not just sell, but will virtually wipe everything else out. They have been selling to almost 100 percent of the fuel-oil dealers who see their system . . . and now they have a bookkeeping package that is doing the same for accountants.

Let's have more articles on business applications for microcomputers.



Imsai has not been resting. Their new low-cost system, VDP-42, was on display. This has two mini-floppies built in.

The new SWTP terminal, in addition to having a good deal of memory built in, which allows it to be used in a remote batch situation, comes in decorator colors. Watch out, Lear Siegler!

One of the newest systems out is the Exidy Sorcerer. With this system, you plug the programs into a slot on the right-hand side. It's an attractive system and has some interesting graphics capabilities. That 8×8 graph you see on the screen is part of a scheme for allowing you to create your own graphics figures. With this, you can define your own characters and then use them when you like . . . or change them.

Xitan had their new system, The General, on display. This one strays from the S-100 bus and has the whole works in a console, complete with the dual disks. More and more we see computer hobby equipment firms going for the business market.

Software Review

That headline is deceptive, for this actually is a review of an audio-cassette demonstration of the Newtech music board and software. Newtech amazed the microcomputer industry with their S-100 music board, which was displayed at Computermania in August 1977. This $60 board even had a small speaker built in for monitoring!

Today Newtech has a second board that plugs into the SWTP 6800 system, also selling for $60. But, just in case you are a bit cautious with your money, Newtech has prepared a cassette with some sample tunes you can concoct with your computer and one of these boards. Frankly, I've heard catchier music and I doubt if you will put on this cassette and then settle back to enjoy the tunes on it: "The Entertainer," "Dixie," "Star-Spangled Banner." Sixteen of 'em on one side of the tape, and a sonata for clarinet and computer on the other. That one is a bit catchier, and you might want to show it off more than the others. The cassette is $5.

There was a demo of computer-generated music at the Philly show, and much of it was pretty dismal. Some of the four- (and more) part music was interesting, but I didn't have any inner urges to collect cassettes of computer music as a result of the Philly demo. However, I did want to try my hand at composing via computer.

You, too, can thrill to computer music that is about as exciting as a novice on an ocarina.

Newtech Computer Systems, 230 Clinton, Brooklyn NY 11201.

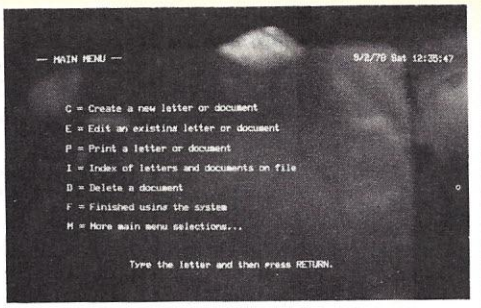
The DEC Store

The first Digital Equipment Corporation store opened recently in the New Hampshire Mall, not far from *Kilobaud* HQ. Naturally we drove over to take a look and see how they were doing, waiting a few weeks for them to get settled in.

Before Digital starts opening a

Though I arrived during a time when the mall was quite crowded, the DEC store was not. It's attractively laid out, but there isn't anything much happening in it so there is nothing to draw people in. On later visits to the mall I found the store without customers most of the time.

"Plus service," eh? That's a little scary, but the price is modest at under $225 per month. It looks awkward to use, but at that price, how much could customers save by buying a microcomputer system? Not so much . . . and they would still have to find the software.



Here's the menu. It's certainly simple and geared to the usual office environment. Some word-processing systems get into very complex choices that call for a good deal of expertise and scare off the non-technical people.

The displays at DEC are quite formal and definitely "don't touch me" in tone. This $12,490 word-processing system might sell better if there were more explanation of what word processing is and how this expensive unit can save you money. If lawyers knew how simple it is to work up standard legal forms with this type of system and that it might save them the cost of the equipment right off the bat just in saved typing time, interest might increase.

lot more stores it might be worthwhile for them to check out some microcomputer stores and see where the action is. Most stores have a very busy literature section, with all of the magazines and a good selection of books, thus providing the newcomer to small computers a way to get the fundamental information needed to cope. If you don't have traffic into your store, you aren't going to have sales.

One of the other sales obstacles facing DEC is their emphasis on the FOCAL language. BASIC may have its drawbacks, but the wide use of it for microcomputers has forced the development of a growing number of programs in BASIC, most of which can be translated to work with the many dialects of the language. Despite the large number of DEC systems already sold, there is a shortage of application programs for small business in FOCAL. A look through the DECUS book of programs is not encouraging.

It's possible that I may be biased on this, so if there is anyone out there with a strong background in DEC and DECUS programs, I'm sure *Kilobaud* readers would be interested in a better perspective . . . if any. I try to get the best information I can and pass it along; however, we need all the input we can get on software and systems for business.

What Are the Facts of Program Publishing?

As more and more firms spring up wanting to publish and distribute programs, there are some facts that programmers should consider. It is all too easy for the naive to be taken to the cleaners . . . and the amounts of money involved are large enough to bring out the most unscrupulous promoters.

The amount of money a program can earn is determined by the marketing ability of the publisher. Today, with roughly 5000 stores selling computers and all in desperate need of well-tested and packaged programs, the investment and the staff necessary to market programs is impressive. Just to ready a program for production costs over $2000. Then there is the first publication run of the program, which adds another $10,000 to the costs before any income is involved.

With Instant Software we are gearing up to produce a minimum of 10,000 copies of any new program. This would mean an initial royalty payment of nearly $10,000 for many programmers . . . and it could easily double that if the program was distributed in the Radio Shack stores. The lure of this kind of money has already brought in some programs that obviously have been stolen from others, and I think we'll be seeing a lot more of that.

One stratagem is for an individual to set up a "software exchange." This encourages hobbyists to send in their programs for distribution. Oh, they will be distributed, but with the royalties going to the exchange entrepreneur, not the author of the program.

Programs will sell well if they

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are advertised, promoted, distributed to where customers can buy them and are a good value. The larger the outfit doing the distribution and promotion, the better the sales . . . and the more the royalty.

Opportunity Knocketh

In addition to the wads of money that can be made writing programs for our microcomputer systems, there are also fortunes to be made in designing and marketing gadgets and accessories for computers which will permit them to do the many things we would like them to do. I've written about this in the past, but it needs amplification.

It was only three short years ago when we were all excited over the Mits Altair system. You may remember that just about the only use suggested for a microcomputer around the home was watering the grass. Despite that prediction, as far as I know no one is yet watering his grass by microcomputer. What happened to the Great American Dream?

The fact is that no one has bothered to put a grass-watering kit with an S-100 interface on the market. All it takes is a dampness sensor to stick into your lawn, a board to plug into your computer that will check out the readings from this sensor and a solenoid-operated valve for the sprinkling system, which is driven by an output from the computer. Nothing very complicated, really, it's just that no one has put the kit together yet and marketed it. I don't know if such a kit would make a million dollars, but I'd bet it would sell well.

Until we have packaged accessories such as the lawn-waterer, complete with the software to make 'em work, we will have to sell dreams instead of reality. There are hundreds of gadgets that could be developed to work with computers. Think about it and let your imagination run.

What about door locks that can be operated by your computer? . . . perhaps a sensor to let you know how much oil is left in your home fuel-oil tank? . . . and another for your propane tank, if you have one. For security we need motion sensors, light sensors, slow-scan cameras and interfaces, smoke sensors, water sensors, etc.

How soon will we have an optical reader for scanning questionnaires for pencil-marked answers or for inventory taking? There are nice expensive readers for maxi systems; now we need a simple one for microcomputers.

Another need is for some sort of mag tape backup for those Winchester 75-megabyte disks, but a tape system priced for the microcomputer world.

This brings up the need for an operating system for these relatively inexpensive drives that will permit the use of low-cost microcomputers as remote batch terminals. With this type of system, you would have a low-cost and practical system for schools and businesses. These systems would support dozens of intelligent terminals, each doing different tasks. Oddly enough, the TRS-80 is powerful enough to support a lot of other similar systems if you have the operating system and use a remote batch operation. The programmer who comes up with a good operating system for making all this happen will have the ticket to a very comfortable future in his hand. I know I could sell such a system and parlay it into a royalty of well over a million dollars.

When I see what is possible with microcomputers, given the right programs, I get a very funny feeling when I look at the Prime computer system, which we use for *73 Magazine* and which is bogged down with a fraction of the work I expected from it. Apparently I'm not the only one to have these problems. I mentioned my miseries with our Prime to a girl in one of the exhibits at the recent Boston University computer show, and she said she had run into the same thing with the Prime in a hospital system she had been involved with. Has anyone else suffered?

There is no question that we will continue to see improvements in microcomputer hardware—and we are beginning to see some good software on the horizon—but we are still dreadfully short on accessories to connect to our systems and interface them to the world. *Kilobaud* will be most interested in publishing articles on such accessories. Get cracking on the situation and let's see what happens.

Software Consulting

Perhaps my plans for wholesaling software are too enthusiastic, but considering the number of microcomputers being sold today and the growth curve of the industry, I'm aiming at producing about two new computer systems per day by the end of 1979 and five a day in 1980. If we can get to an average of five a day sooner, all the better.

The evaluation of the content, prospective sale, program retail price and other factors will be done by associate editors who are functioning as software consultants. As nearly as possible we will try to match talent to the job at hand, sending accounting-type programs to accountants for evaluation, medical programs to doctors, etc.

In order to process and evaluate enough programs to result in a net output of two per day, we will need a formidable array of consultants. If you figure that there probably will be an average of two programs in each cassette package we put out . . . and further that only one program in five will make the grade . . . this means 20 programs per day will have to be evaluated . . . one hundred a week!

Can the industry support such an effort? It's difficult to project what may happen with microcomputers in the near future, particularly after we start having programs available for them in quantities and on a wide variety of subjects. We do know that there are now well over 250,000 microcomputers out there and that they are selling at the rate of about 25,000 per month at present. It is not overoptimistic, I think, to look for perhaps 400,000 to be sold in 1979. This would give us around 650,000 microcomputer programming customers.

How many programs will 650,000 microcomputer owners buy? That's anyone's guess. If they bought an average of two a month, that would come to some 15 million in a year. At an average retail price of $8 per program tape we would have a $125 million industry. If microcomputerists run true to form and spend equally for software and hardware, we can expect perhaps four times that investment.

Whatever happens, there is going to be a big requirement on our part for software consultants to check out programs. We've started out with a pay scale of $3 per hour for the work . . . a figure that is sneered at by some and eagerly embraced by others. It does appear at this moment that we will be able to develop a staff of associate editors with excellent credentials at the figure we've proposed since the work involved is also a lot of fun.

There are some other obvious advantages too, brought about by the need for a test laboratory in your home, an office in your home, the equipment necessary to perform your work, the books and magazines you must have to properly perform your work, telephone and other incidental expenses, visits to trade shows, etc. You'll probably feel it important to have the latest in equipment; perhaps you'll want to have several different systems up and running for checking out programs and possibly for helping with the translation of programs from one format to another. All of these expenses are business expenses and are necessary for you in your consulting work for us.

If you spend an average of two hours a day this will come to about 15 hours a week, $45 . . . $2250 per year. The IRS does not like you to take a loss in your business every year, but they will generally go along with the expenses of developing a new business, and start-up expenses are going to be high for any new effort.

If you are interested in climbing aboard our leaky boat, we'll need information on what equipment you have, what languages you are familiar with, how much experience you've had at microcomputing and programming, what specific fields of expertise you might be able to offer, etc. In return for this we'll send you a package of information on the associate-editor scheme. We do want to be sure that when you get a program to evaluate you will be able to return it to us within a week . . . and that all material will be kept in confidence. No program leaks . . . even to good friends.

Hiring

The Instant Software project is by no means up to full complement. There is still a need for a computer hobbyist with a lot of hardware experience to set up systems, check them out, write reports on them and get accessories working.

There are some spots in advertising, marketing and sales too. Unless I've been dreaming a lot, this new project should turn out to be big and the people who help make it go should end up in good shape.

El-Cheapo Microfilming

While preparing the instruction booklet for a TRS-80 business program, I realized that

(continued on page 21)

LEGAL/BUSINESS FORUM

Kenneth S. Widelitz
Attorney-at-Law

A lot has been written on the subject of software and copyright. In fact, two previous *Kilobaud* Legal/Business Forums (November 1977, April 1978) have been devoted to the subject. What's all this brouhaha about? Why is the protection of computer software such a burning issue?

In my opinion, the excitement all boils down to the simple fact that we now live in an age of alchemy. No, I don't mean that someone has invented a process for turning lead into gold. What we have is even better. It is now possible to take an item worth $5 (a blank diskette), insert it into a disk drive, take an item worth $1000 (a diskette with a general ledger package on it), put that into a second drive, push a button and, a minute later, extract two diskettes with a $1000 general ledger package on each. That's what I call alchemy.

The point is that hundreds, perhaps thousands, of hours of work can be duplicated in a matter of seconds. That is not true with respect to hardware. Certainly, someone can rip off the design for a piece of hardware, but it takes a lot of capital and a lot of time to gear up to produce that hardware. And it's difficult to produce that hardware in the comfort of one's own home. Not so with the rip-off of software.

CONTU's Final Report

In the November 1977 Legal/Business Forum I discussed a preliminary report issued by CONTU, the National Commission on New Technological Uses of Copyrighted Works. On July 31, 1978, CONTU issued its final report. The report is available free of charge from CONTU, Washington D.C. 20058, telephone (202) 557-0996.

CONTU, in its investigation, has recognized that the alchemy problem is real. CONTU expressed the problem as follows: "Forces of economic and technological development are leading to what has been called the post-industrial society, one in which the source of wealth lies not only in the production and distribution of goods but also in the creation and dissemination of information."

Continuing in the same vein, the report goes on: "The cost of copying a reel of magnetic tape, whether it contains a Chopin étude or a computer program, is small. Thus the following proposition seems sound: If the cost of duplicating information is small, then it is easy for a less than scrupulous person to duplicate it. This means that legal as well as physical protection for the information is a necessary incentive if such information is to be created and disseminated."

CONTU's Recommendations

CONTU's recommendations are addressed to Congress, which must pass appropriate legislation in order to amend the Copyright Act of 1976. CONTU recommends that a definition be added as follows: "A 'computer program' is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result." CONTU also recommends the following language be implemented in the Copyright Act:

Notwithstanding the provisions of Section 106, it is not an infringement for the rightful possessor of a copy of a computer program to make or authorize the making of another copy or adaptation of that computer program *provided*:

(1) that such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner, or

(2) that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful.

Any exact copies prepared in accordance with the provisions of this section may be leased, sold or otherwise transferred, along with the copy from which copies were prepared, only as part of the lease, sale or other transfer of all rights in the program. Adaptations so prepared may be transferred only with the authorization of the copyright owner.

As discussed in the previous Forum on copyright, it is CONTU's conclusion that the input of a program into a computer is the preparation of a copy and, therefore, a potential infringement of copyright. The new section quoted above indicates that a person in the rightful possession of a copy of a program may load the program. However, the sale of a copy of a rightfully possessed program must be a sale of all rights in the program, thus creating a new rightful possessor and destroying that status as regards the seller.

The proposed language quoted above also covers, at least in part, a question that was raised in the April 1978 Legal/Business Forum regarding derivative works. CONTU has recognized that because of the lack of standardization among programming languages and hardware, often one who rightfully acquires a copy of a program frequently cannot use it without adapting or modifying it so that it will run in the computer for which the program was purchased. The proposed language quoted above refers to those "patches" as "adaptations."

The language of the proposed section indicates that programs which have been adapted to run in a specific computer could *not* be conveyed to others along with the unmodified program without the express authorization of the owner of the copyright in the original work. This does not mean that the unmodified program could be sold while the modified version was retained. That would be a violation of the Copyright Law.

That distinction regarding adaptations seems to me to be a bit ludicrous. Certainly the "adapter" could sell the original program unmodified and, in a separate transaction, sell the "adaptations" or "patches." The "patches" alone could be copyrighted by the adapter. Why prohibit the use of a one-step transaction when legally the same thing can be accomplished using two steps?

Recommendations for Regulations

CONTU has recommended that regulations for notice, deposit and registration of programs should be promulgated by the Register of Copyrights. CONTU recommends that programs marketed in a form readable to the human eye should contain the copyright notice before the list of instructions that comprise the program. With respect to machine-readable formats, CONTU recommends that the notice be such that the program could not be listed without reproducing the notice at the beginning of the instructions.

Interestingly, CONTU goes on to say that the containers in which copies of such machine-readable programs are sold, leased or transported should bear notice as should devices such as (1) reels upon which magnetic tape is wound, or (2) semiconductor chips in which programs are stored. The latter may create some conflicts with the Patent Law. Some companies have successfully patented computer programs by getting the patent on "firmware." Since patent and copyright are mutually exclusive, it will be interesting to see how this conflict is resolved.

In discussing the deposit and registration requirements, CONTU notes that programs are frequently modified and updated to reflect improvements or changes. CONTU acknowledges that the repeated deposit of each version of a program would be burdensome both to the program proprietor and to the Copyright Office. CONTU recommends two alternative solutions to this problem. One is a system of temporary deposit and the other is a scheme in which there would be a permanent deposit of complete copies of original versions of a program with descriptions rather than complete copies of amended versions being filed later.

Scope of Copyright

CONTU's report contains an interesting discussion of the distinction between programs, which CONTU recommends be subject to the Copyright Laws, and processes that are not subject to copyright. In pointing out the

distinction between programs and processes CONTU states:

In *Baker v. Selden* the Supreme Court held that a valid copyright in a book describing a system of accounting, based upon the now-universal T-accounts, did not bar others from using that accounting system. This holding is often misconstrued as imposing a limit on the copyrightability of works which express ideas, systems or processes. As Professor Nimmer observes, "The rationale for the doctrine of *Baker v. Selden* in no event justifies the denial of copyrightability to any work." The case properly stands for the proposition that using the system does not infringe the copyright in the description.

With respect to computer programs it may be said that the expression adopted by the programmer is the copyrightable element in a computer program. The actual processes or methods embodied in a program are not within the scope of the Copyright Law. CONTU goes on:

Thus one is always free to make a machine perform any conceivable process (in the absence of a patent), but one is not free to take another's program. This general rule is subject to exceptions which restrict the power of copyright owners. These exceptions might be thought of as the "insufficient intellectual labor" exception and the "idea-expression identity" exception.

The "insufficient intellectual labor" exception encompasses the idea that a program consisting of a very few obvious steps cannot be the subject of a copyright as is the case with instructions such as "apply hook to wall."

The "idea-expression identity" exception provides that copyrighted language may be copied without infringement when there is a limited number of ways to express a given idea. That is, copyright protection for programs does not threaten to block the use of ideas or program language previously developed by others when that use is necessary to achieve a certain result.

The CONTU report states, "When other language *is* available, programmers are free to read copyrighted programs and use ideas embodied in them in preparing their own works." In other words, the programmer is always free to make the computer do the same thing it would have done had the copyrighted work been placed in it, but only by the programmer's own creative effort rather than piracy.

Therefore, if you see a Star Trek program with great graphics displayed on a CRT and figure out how to do the same thing without copying the underlying program, there is no copyright infringement even though the display of your programming efforts is identical to the results of the efforts of the programmer whose program you observed.

In CONTU's concluding remarks regarding the line drawn between the copyrightable form of a program and the uncopyrightable process it implements, the report states, "In the event that future technology permits programs to be stated orally for direct input to the computer through auditory sensing devices or permits future infringers to use an author's program without copying, difficult questions will arise." CONTU states, however, that to attempt to establish such a line in a report written in 1978 would be futile.

A Dissent

As with the preliminary report, Commissioner John Hersey has dissented from CONTU's recommendations. Hersey's reasoning is the same as in the prior report, and since that was discussed in the November 1977 Forum I won't go into it in detail.

One interesting aspect that Hersey now mentions deals with the issue of communication. He says, "But a program, once it enters a computer and is activated there, does not communicate information of its own, intelligible to a human being. It utters work. Work is its only utterance and its only purpose. So far as the mode of expression of the original writing is concerned, the matter ends there; it has indeed become irrelevant even before that point. The mature program is purely and simply a mechanical substitute for human labor."

Later in his report Hersey says, "Here, for the first time, protection of copyright would be offered to a 'communication' with the machine."

In my opinion, Hersey makes some good points in his dissent, but they are not significant enough to change my agreement with the conclusions expressed in CONTU's report.

Kilobaud Legal/Business Forum
c/o Kenneth Widelitz
10960 Wilshire Blvd.
Suite 1504
Los Angeles CA 90024

PET-POURRI

Len Lindsay

Len Lindsay is a certified elementary-school teacher. He has been interested in computers since high school. Collecting and distributing information is one of the things Len likes to do; since he owns a PET computer, he has collected quite a bit of information about it. He is the editor of the PET Gazette *and hopes that its PET Cassette Exchange can distribute good programs inexpensively. Presently Len is employed by the state of Wisconsin, Dept. of Administration, Data Control.*

With over 100 companies supporting the PET, you can expect to be able to get almost any plug-in accessory you want. You're right! The first things on most users' lists are a printer, floppy disk, extra memory and full-size keyboard.

Accessories

Commodore first announced their printer early last summer . . . expected delivery in late August. The price has since then gone up $100 to $695 and delivery is now indefinite, probably March or later. But there are several adapters on the market that allow any RS-232 printer to be hooked to the PET.

Connecticut microComputer (150 Pocono Rd., Brookfield CT 06804) has a printer adapter for $169 completely assembled with case, power and cables, and the Networks (5924 Quiet Slope Dr., San Diego CA 92120) has a dual-channel, bidirectional RS-232 module for $280, assembled.

Two companies now have floppy disk modules for the PET: Convenience Living Systems (648 Sheraton Dr., Sunnyvale CA 94087) and CGRS Microtec (PO Box 368, Southampton PA 18966). Commodore supposedly will have a dual mini-floppy for $1000, but don't expect to get one till next summer.

The PET is extremely memory efficient, and you will find that even a 16K program can be coded into an 8K PET. Thus, for ordinary use, 8K should be enough. There are, however, several memory expansion modules available now (none from Commodore yet).

Convenience Living Systems has the ExpandaPET module, 16K for $399. Computer Mart Systems (13 East 30th St., New York NY 10016) has the PME-1 with 16K for $550. International Technical Systems (PO Box 264, Woodbridge VA 22194) has the PME-8K for $279.

Due to the PET's small keyboard, most users wish to have a full-size keyboard to plug in, but still keep the original keyboard functional. Excel Company (2241 Tamalpais Ave., El Cerrito CA 94530) has an adapter for $100 that allows you to plug in any ASCII keyboard and use it simultaneously with the original keyboard. For $175 they have a full-size keyboard you just plug in and use. New England Electronics (248 Bridge St., Springfield MA 01103) has a full-size keyboard for about $125 that operates simultaneously with the PET keyboard.

Next month we will go over more products for the PET, ready to plug in and use.

Publications

PET users should be aware of the following PET publications, books and magazines. There are four principal publications dealing strictly with the PET. These publications are similar and each contains information on the PET and how to program it, program listings, product announcements and program exchange information.

The PET Gazette magazine (1929 Northport Dr., Room 6, Madison WI 53704). Subscrip-

tion is *free*, published bimonthly. Issue #5 was 64 pages. Beginning in 1979 will be a full-size magazine. Also includes a directory of all PET-related companies with addresses, lists of all PET accessories and software available, directory of PET user clubs and meeting information, reviews of MANY accessories and software, and proposals of standard conventions to follow to keep most users compatible with each other.

The PET Paper (PO Box 43, Audubon PA 19407). Subscription is $15 per year, published 10 times per year. Issue #6 was 22 pages. Also includes PET clubs information and some review.

PET User Notes (Box 371, Montgomeryville PA 18936). Subscription is $5 per year, published bimonthly. Issue #5 was 16 pages.

From England—*Commodore PET Users Club Newsletter* (Commodore Systems, 360 Euston Rd., London England NW1 3BL. Subscription is 10 pounds, published bimonthly. Issue #3 was 40 pages. This is the official Commodore newsletter in Europe. Very informative.

A few books of direct interest to PET users are already available.

Total Information Services (TIS, PO Box 921, Los Alamos NM 87544) publishes five workbooks for the PET: *Getting Started with Your PET* ($4), *String and Array Handling* ($4), *Graphics* ($5), *Cassette I/O* ($5) and *Miscellaneous* ($4). These workbooks explain how the PET functions and has many programming tips.

The PET Paper (see above) publishes the *PET Tutor*, a manual for the beginning PET user. It is accompanied by 20 8K lessons on tape, ready to load into your PET. The cost for the manual and tapes is $39.95.

A few more books should be available soon. Osborne and Associates are working on a PET user manual, which should come in with the new year. *The PET Paper* hopes to have their book about the PET available by March 1979. The Microcomputer Resource Center will be publishing a book, *The Best of the PET Gazette*, during November 1978.

Several magazines feature the PET every issue. *Kilobaud* now has a PET column (which you are now reading), and *Creative Computing* (PO Box 789-M, Morristown NJ 07960) is featuring a column for the PET by Greg Yob. *Recreational Computing*, formerly *People's Computers* (1263 El Camino Real, Box E, Menlo Park CA 94025), has a section titled SPOT each issue. They have program listings and information for PET users. *Calculators/ Computers* has a feature article each issue about the PET, with programming aids or listings.

```
100  PRINT"Do you need instructions?"
110  GETA$: IF A$ = "" THEN GOTO 110
120  IF A$ = "Y" THEN GOSUB 1000:REM INSTRUCTIONS START AT 1000
130  Your program continues here.
Remember, your instructions are in a subroutine beginning at 1000. The
last command should be:
1999  RETURN (use the appropriate line number)
```

Example 1.

```
1500  PRINT"This is the end of instructions"
1510  PRINT"Hit any key to continue"
1520  GET A$: IF A$ = "" THEN GOTO 1520
1530  Program continues here after waiting for the user to hit a key
```

Example 2.

Software

There is quite a bit of software for the PET available on cassettes. There are probably over 1000 different programs already.

Personal Software (PO Box 136-L10, Cambridge MA 02138) has several good programs. For $20 the PET will challenge you to a game of chess, and will probably beat you. For $15 you can play bridge with your PET.

I composed this article using several different word processor programs currently available. Connecticut microComputer has a good word processor for $30.

Business software is now becoming available. Sawyer Software (828 Lewis, Rte. 3, Dexter MO 63841) has some good programs, including Accounting ($25), Payroll ($30) and Business Analysis ($30). Channel Data (5960 Mandarin Ave., Goleta CA 93017) has Personal Ledger for $20.

As you might expect, there are *many* games available. CMS (5115 Menefee, Dallas TX 75227) has some excellent games. For $10 each you can play a very realistic, full graphics game of blackjack, roulette, craps or baccarat. You also can challenge the PET to a game of checkers, qubic, or gomoku.

Creative Computing is selling cassettes with about five or six programs for $7.95. Their games make use of the PET's graphic capabilities.

Dr. Daley (425 Grove Ave., Berrien Springs MI 49103) has many programs for sale, including Star Trek ($7.95), Dictator ($8.95) and Football ($6.95).

New England Electronics (248 Bridge St., Springfield MA 01103) is a dealer for many of the PET software companies. They also market their own programs, such as War Games Package ($25), four well-done animated, sound-effect programs. Write for their catalog of PET products.

There are several places offering a PET software exchange, with purchase options.

The PET Cassette Exchange (1929 Northport Dr., Room 6, Madison WI 53704) has over 200 programs available for exhange. Categories are: *Useful*—Budget, Biorhythm, Decision Maker, Loans and more. *Demo*—Abstract Art, Kaleidoscope, Star Wars Pictures and more. *Educational*—Animal, History Quiz, Spelling Test, States & Capitals and more. *Music*—Music Keyboard, Computer Music, Theme from Star Wars and more. *Simulations*—Market, Stock Market and more. *Cards*—Blackjack, Poker and more. *Games*—Breakout, Checkers, Othello, PET Pong, Snake, Star Trek and more. Selected programs from the exchange are available as packages of seven programs for $10.

Both the *PET Paper* and the PET User Group (Box 371, Montgomeryville PA 18936) have software exchanges with purchase options.

Write to each exchange for full information on how their exchange works.

Another way to acquire good programs is to subscribe to *Cursor* (Box 550, Goleta CA 93017). *Cursor* is a magazine cassette for the PET. Each month you receive about six programs on a cassette. The programs are very good and most are unique. The cost is $24 per year.

Programming Hints

Use lowercase whenever the user has to read a lot of text, such as in instructions. To put the PET into lowercase mode simply add a line: 225 POKE 59468,14: REM LOWERCASE MODE. To return to graphics mode: 280 POKE 59468,12. Don't assume that the PET will be in graphics mode. One of your first lines should poke in the mode you wish to use first. Throughout your program you can switch from graphics to lowercase and back again.

The PET has a GET command. This allows you an easy way to input information, while your program is running, without having to hit the return key (see Example 1). Another use of the GET command is for indefinite delays (see Example 2). Clear the screen before starting. Use a line such as: 60 PRINT "[CLR]":REM CLEAR THE SCREEN.

As with the line above, I will use standard conventions for listing PET graphics and special keys. (1) Use KEY CAP identifiers if possible and enclose them in square brackets (use regular parentheses if square brackets are unavailable). (2) Use a number before an item to show how many times it is to be repeated. (3) Enclose consecutive special keys within the same brackets, separated by commas (see Example 3). Remember, a capital letter inside brackets means to type the shifted character.

(continued on page 21)

```
230  ?"[HOME]":REM PRINT A HEART 3 SPACES DOWN FROM THE TOP LEFT CORNER
You type:
2 3 0  ? " the HOME key CURSOR DOWN 3 times shift S " : R E M P R I N T
A etc.
```

Example 3.

BOOKS

A Short Course in Programming, Vol. I
Tom Pittman
Netronics R&D Ltd.
New Milford CT
80 pages, $5

For the last few years, the hobbyist who had a system based on the RCA 1802 COSMAC microprocessor had to look enviously at the users of "those other" chips who could choose from among many books geared to their micro. Although RCA has had several books in print that addressed the COSMAC, these were aimed at the engineer and designer, rather than the beginner. Finally, though, a publication has appeared that is the answer to many a prayer.

A Short Course in Programming packs a lot of information into its 80 pages, including all of the commands for the 1802, arithmetic and logic, and control instructions, as well as the video features available on most Elf and Elf II microcomputers. The chapters go into detail by utilizing appropriate programs rather than relying on printed descriptions. This allows for much better understanding, although the reader may find himself spending several evenings on one program in order to fully master the concept involved.

The programs not only make the concepts presented understandable and interesting, they can be quite impressive by themselves. An example is a video clock that counts seconds on a TV screen.

Although the booklet is primarily aimed at owners of Netronics' Elf II, anyone with an 1802 system with video output can use it. The programs will run in either the original 256-byte memory of the Elf or in the memory of an Elf that has been expanded either to include the monitor or several K of RAM . . . although the longest program occupies just a little less than one-quarter K.

As a firm believer in the merits of the 1802, I found the booklet informational and useful. I was delighted to see, in print, Tom Pittman's belief that the subroutine-call capability of the 1802 makes it more powerful than any other 8-bit microprocessor.

Stephen F. Nowak
Toledo OH

The SSI Microcomputer Software Guide
Jim Schreier
SSI Publications, 1978
140 pages, $7.95

For some microcomputerists, there is no greater fulfillment than the successful completion of a complex and lengthy software project. The rest of us owe a debt of gratitude to these intrepid programmers—they sure save us a lot of work. If you would rather use software than write it, *The SSI Microcomputer Software Guide* can help you bypass the sometimes painful programming process.

The author has divided software into 236 classifications, arranged alphabetically from Accounting and ASCII to Word Processing and Zip Code. It's an interesting commentary on the state of microcomputer software that only nine pages of the book are devoted to business programs, whereas the "Games" category fills a healthy 21 pages of the *Guide*. Programmers take note: There are games aplenty for our machines. How about bending your talents toward the practical side of things? Would you believe there are 18 different Star Trek programs listed? That makes Star Trek a category unto itself. Enough, already!

Each of the more than 2200 entries in the *Guide* tells you the language in which the software is written and where it can be acquired. The entries have been compiled from the offerings of software houses, books, magazine articles, pamphlets, etc. In all, software from 130 different sources is indexed. Best of all, the addresses of all 130 sources are listed at the rear of the book.

The *Guide* contains much more than Star Trek games, of course. In fact, the chances are good that you'll find at least one program in just about any category you can name. There is quite a selection of computer-assisted instruction (CAI) programs, for example. You'll find an entry under "Gardening." There's even a "Judo" category.

The $7.95 price tag on this 140-page volume may seem a little steep to some, but that's a decision you'll have to make for yourself. It just could save you from reinventing the wheel. SSI Publications, 4327 East Grove St., Phoenix AZ 85040.

Jeff DeTray
***Kilobaud* Staff**

An Introduction to Personal and Business Computing
Rodnay Zaks
Sybex, Inc., Berkeley CA
245 pages

In *An Introduction to Personal and Business Computing*, author Rodnay Zaks fulfills his promise to present "a practical, progressive introduction to all the elements of a real computer system" for readers unfamiliar with computers. Businessmen and individuals interested in computing can gain a clear, comprehensive introduction from this book. Experienced computer people can gain insight into the microcomputer arena and its relationship to larger-scale computing systems.

After he has introduced the reader to some existing and some possible computer applications, Zaks explains the fundamentals of computing. He is practical when he points out that economics is a major factor in determining what computer systems are developed.

His techniques for emphasizing the economic aspects of computers are: describing all the computer system components and discussing the cost considerations employed in selecting from the myriad of choices; giving present-day prices to help relate the costs of components; and helping develop an understanding of values.

Buying a computer, as Zaks indicates, is not the only way to get into computing. Other routes he mentions are the service bureau and time-sharing, both of which provide a low-cost "try before you buy" alternative to purchasing equipment.

Rodnay Zaks is a knowledgeable professional, renowned in his business. He offers a wealth of information and good advice in this simple, yet comprehensive, text. By carefully reviewing this book, you will have a good background for further study. You will come away with an appreciation of the broad spectrum of considerations involved in obtaining a computer and have a list of specifics for further research.

Charles E. Moellinger
Birmingham AL

Some People Just Won't Believe a Computer
Donald D. Spencer
Camelot
Ormond Beach FL, 128 pages

One trademark of good (i.e., funny) humor is "the twist"—an unexpected or clever reversal of a familiar situation. *Some People Just Won't Believe a Computer* just doesn't do it. This book manages to present nearly every stock comedy, mundane and extraterrestrial situation in cartoon form and throw a computer-oriented caption (sometimes misspelled) underneath it. For example: A man is lying on a psychiatrist's couch; the shrink is taking notes. The supine sap laments: "My computer doesn't understand me."

I'd begin to question the sanity of anyone who would pay $4.95 ($8.95 hardbound) for this assemblage of 123 cartoons (a few virtual duplications of others) by cartoonists John Beatty, Sid Corhern, Rick Dreyer and Don Spencer—the compiler.

Apparently the theme of *Some People Just Won't Believe a Computer* is that the computer personified is "smiles, chuckles and just plain fun." I don't believe it. It takes more than an anthropomorphized anthology of cartoons to amuse or generate laughs.

In all fairness to the book, though, several of these cartoons exhibit wit and innovation. The final drawing features a Hamlet-like figure cogitating. His thought balloon reads: "2B v $\overline{2B}$."

However, if you, like Hamlet, suffer from indecision, the question "to buy or not to buy?" this book should be an easy one to answer.

John Barry
***Kilobaud* Staff**

Color. VP-590 add-on Color Board allows program control of 8 brilliant colors for graphics, color games. Plus 4 selectable background colors. Includes sockets for 2 auxiliary keypads (VP-580). $69.*

Sound. VP-595 Simple Sound Board provides 256 tone frequencies. Great for supplementing graphics with sound effects or music. Set tone and duration with easy instructions. $24.*

Music. VP-550 Super Sound Board turns your VIP into a music synthesizer. 2 sound channels. Program control of frequency, time and amplitude envelope (voice) independently in each channel. Program directly from sheet music! Sync provision for controlling multiple VIPs, multitrack recording or other synthesizers. $49.*

Memory. VP-570 RAM Expansion Board adds 4K bytes of memory. Jumper locates RAM in any 4K block of up to 32K of memory. On-board memory protects switch. $95.*

EPROM Programmer. VP-565 EPROM Programmer Board comes complete with software to program, copy and verify 5-volt 2716 EPROMs—comparable to units costing much more than the VP-565 and VIP put together! Programming voltages generated on board. ZIF PROM socket included. $99.*

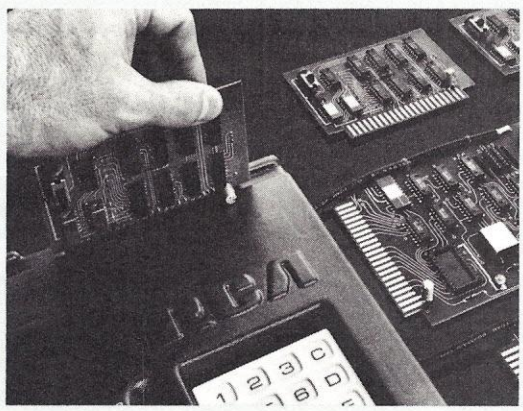
EPROM Interface. VP-560 EPROM Interface Board locates two 5-volt 2716 EPROMs (4K bytes total) anywhere in 32K of memory. VIP RAM can be re-allocated. $34.*

ASCII Keyboard.** Fully encoded, 128-character ASCII encoded alpha-numeric keyboard. 58 light touch keys including 2 user defined keys! Selectable upper and lower case. Handsomely styled. Under $50.*

Tiny BASIC.** VP-700 Expanded Tiny BASIC Board puts this high-level language on your VIP. BASIC stored in 4K of ROM. Ready for immediate use—no loading necessary. This expanded BASIC includes the standard Tiny BASIC commands plus 12 additional—including color and sound control! Requires external ASCII encoded alpha-numeric keyboard. $39.*

Auxiliary Keypads. Program your VIP for 2-player interaction games! 16-key keypad VP-580 with cable ($15*) connects to sockets provided on VP-590 Color Board or VP 585 Keyboard Interface Card ($10*).

COSMAC VIP lets you add computer power a board at a time.



With these new easy-to-buy options, the versatile RCA COSMAC VIP (CDP18S711) means even more excitement. More challenges in graphics, games and control functions. For everyone, from youngster to serious hobbyist. And the basic VIP computer system starts at just $249* assembled and ready to operate.

Simple but powerful—not just a toy.

Built around an RCA COSMAC microprocessor, the VIP includes 2K of RAM. ROM monitor. Audio tone with a built-in speaker. Plus 8-bit input and 8-bit output port to interface relays, sensors or other peripherals. It's easy to program and operate. Powerful CHIP-8 interpretive language gets you into programming the first evening. Complete documentation provided.

Take the first step now.

Check your local computer store or electronics parts house. Or contact RCA VIP Marketing, New Holland Avenue, Lancaster, PA 17604. Phone (717) 291-5848.

*Suggested retail price. CDP18S711 does not include video monitor or cassette recorder.
**Available 1st Quarter, 1979.

The fun way into computers.

RCA

NEW PRODUCTS

Edited by Dennis Brisson

Review of Weight Control/ Biorhythm Programs

If you are interested in a new approach to healthy life and dieting, *Kilobaud's* Instant Software program Weight Control will whet your appetite. The reason for using a computer to plan your diet is quite logical: It would be too time-consuming for a doctor to make the calculations for each patient.

This program does not tell you what you should or should not eat, but it does suggest certain caloric diet plans (e.g., 1000 calories per day or 1500 calories per day), and it is totally up to you to pick the types of food to eat and stay on your particular diet plan. This program can determine the exact rate at which you will lose or gain weight.

This program was tested on a friend who lost 10 lbs in 21 days on a 750-calories-a-day diet. The program predicted 22 days to achieve this weight loss. The difference between the calculated time and the actual time required was only one day, a surprisingly accurate prediction.

It is interesting to note that when operating this program, you do not have to press "RETURN" after most of the entries. The "RETURN" must be depressed to indicate end of data only after the entries of numeric data such as height, weight, etc. In this way it makes the operation of the program easier and faster. The program will prompt you for all necessary information, which facilitates the operation of the program. The program occupies about 6.5K bytes of memory.

The second program on the Instant Software packet is Biorhythm. There really is not too much that can be said about this program as there have been so many of them programmed and marketed throughout the country.

However, there are interesting features in this program. First, every bio-chart represents a full month and contains all three biocycles. Second, the time axis is plotted in the horizontal direction, and the operator has the option to display any number of months with just one data entry.

The prompts are quite simple and, in contrast to other biorhythm programs, very clear. However, it takes a long time to calculate and display the biocharts. After listing the program, I found out why. The curves are not displayed at the time when they are calculated, but they are stored in an array and, only after all three curves are stored in this array, the whole array is printed on the screen.

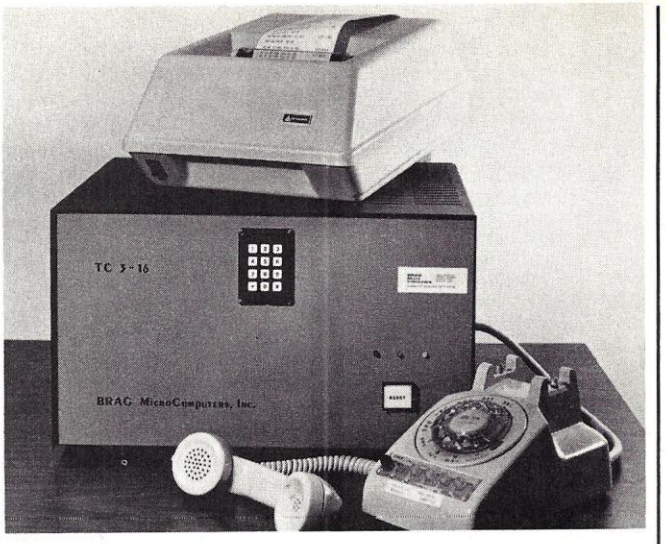
This method slows down the display on the screen, but in case you decide to modify the program for a printer, it is easy to replace the PRINT by the PRINT # statement. Like the Weight Control program, Biorhythm occupies about 6.5K bytes of memory.

The two programs are both recorded on one cassette and packaged in a plastic case. This packing method differs from the first Instant Software programs, which were released and packaged in a hard paper box. I find that the plastic case is far more practical and durable for storing the cassette.

The booklet accompanying the programs contains loading instructions and the program listings. However, the picture displayed on the front of the booklet of the Biorhythm program is not an accurate depiction of how it will be displayed on the Commodore PET; it is, rather, an example of the display as it would appear on the TRS-80.

The care, effort and imagination that have been put into both programs make them well worth the price of $7.95.

D. Borland
36 Ainsdale Road
Toronto, Ontario, M1R 3Y8



The TC-3 from BRAG.

Telephone Cost-Control Center

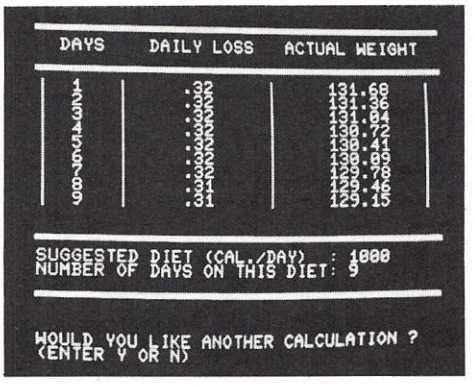
Now you can effectively manage your telephone costs with the Telephone Cost-Control Center (TC-3), the automatic identified outward dialing system (AIOD) from BRAG Microcomputers. Based upon a 6502 microprocessor, the TC-3 is capable of monitoring and logging both incoming and outgoing telephone traffic on as many as 16 separate lines or extensions simultaneously. Equipped with a 40-character-per-line printer and a real-time clock and calendar, the TC-3 prints the following information for each call: date, time of day, area code dialed, exchange and number dialed, duration of call and line or extension number placing the call.

The TC-3 goes after the lion's share of telephone expenses, the *service* expenses, by reducing costs of: *unreconciled* long-distance calls, *unauthorized* long-distance calls and *nonbusiness* local calls. As a management decision tool, the TC-3 will determine: trunk line needs (up or down), peak load analysis, WATS lines requirements, departmental telephone budgets, customer/client chargeback and incoming traffic analysis.

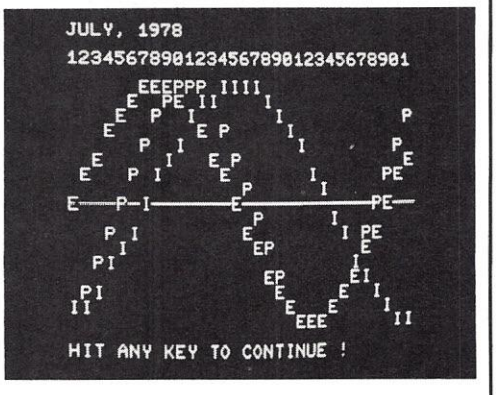
BRAG Microcomputers, Inc., 19 Cambridge St., Rochester NY 14607.

Electric Pencil for TRS-80

The Electric Pencil, the word processing system used on many of the popular S-100 bus systems, is now available for the TRS-80 microcomputer. The Electric Pencil is offered both as a separate software product and as part of a complete word processing package, which includes the TRS232 serial printer interface and a modification kit that provides lowercase entry and display as well as a separate control key. The Electric Pencil opens many new uses for the TRS-80 computer.



PET display of ISI Weight Control program.



PET display of ISI Biorhythm program.

In addition to the standard Electric Pencil features—free format entry, line and character insertion, line and character deletion, forward and reverse scrolling with speed control, string search, coded string search, string search and replace, block moves, inserts and deletions, fully formatted print control, page titling, page numbering, etc. —the TRS-80 version offers the following features:

1) Loads into either Level I or Level II 16K computers from the same tape. Load rate is 500 baud.
2) Operates uppercase only in unmodified machines or operates with upper and lowercase after installation of modification kit.
3) Displays a transparent cursor. The character and the cursor are both visible simultaneously so you can see the character you are editing.
4) Runs either the Radio Shack standard printer through the expansion box or will operate any RS-232 300 baud printer using the TRS232 printer interface.
5) Includes special keyboard software with both 2-key rollover and repeat function (any key will repeat at 10 characters per second after a 0.5 second delay).

The Electric Pencil is priced at $99.95; the TRS232 printer interface is $39.95. Instructions for the lowercase modification are included in the documentation.

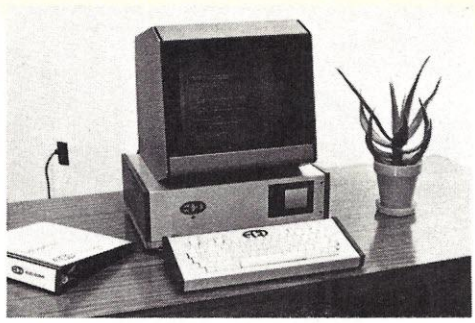
Small System Software, PO Box 483, Newbury Park CA 91320.

Programmable Terminal

Now you can enjoy the convenience of a ROM-based system without sacrificing programmability with the ECD Smart ASCII-2 Programmable Intelligent Terminal. It automatically loads its programs from a built-in minicassette drive when it is turned on. This provides the stability of a ROM while allowing easy changing or updating of the system programs.

The standard terminal/word processing program can be modified to emulate different protocols, character codes, character sets or other specific terminals. Because the character set is also loaded from the minicassette, foreign languages can also be accommodated.

In addition to the terminal program, a version of BASIC is also provided to run in the Smart ASCII-2. It can be run standalone or in communication with other computers. BASIC can also be used to control the RS-232 interfaces, the serial or parallel I/O lines or the analog I/O lines, all of which are standard with the system. In this fashion, the Smart ASCII-2 can be used as a remote intelligent controller and interface to a wide variety of other equipment.



The ECD Smart ASCII-2.

Computer control with the RS-16-HP interface.

The standard Smart ASCII-2 includes a 15 inch CRT, an 80-key keyboard, processor unit with 37K of memory and a minicassette drive with tapes for intelligent terminal and BASIC programs. Unit price is $7700. Options are available.

ECD Corp., 196 Broadway, Cambridge MA 02139.

Morse Code Transceiver

Xitex Corporation, 13628 Neutron, PO Box 402110, Dallas TX 75240, has just introduced a Morse code transceiver designed around a preprogrammed single-chip microcomputer for the generation and reception of Morse code signals using a standard ASCII or five-level terminal (such as Xitex Model SCT-100). Applications include military and amateur, plus certain commercial communication systems.

The microcomputer's on-chip 2048 byte ROM memory contains both the Send and Copy algorithms, plus a software UART with multiple ASCII and five-level baud rates. All timing signals are generated internally from a single external 4 MHz crystal. This not only reduces system costs, but also virtually eliminates RFI generation or susceptibility.

The Copy portion of the device provides automatic synchronization from 1 to 150 wpm while it is continuously computing and displaying the corresponding wpm value. The Send mode features include precise control of the output Morse wpm rate in unit increments from 1 to 150 wpm, plus a 32 byte FIFO buffer that can be edited prior to transmission. Another feature permits both Send and Copy operation in a unique "RTTY Emulate" mode. This permits the transmission of a 60-character ASCII subset using standard Morse codes plus "new" codes defined for special symbols and control characters (such as line feed, space, carriage return, etc.).

The MRS-100 Morse Transceiver is offered in three basic configurations: a partial kit including the microcomputer and blank PC boards for $95; a full kit including an enclosure, power supply and all other components necessary to configure a complete system (less terminal) for $225; an assembled and tested unit for $295.

"Universal" Interface for PET

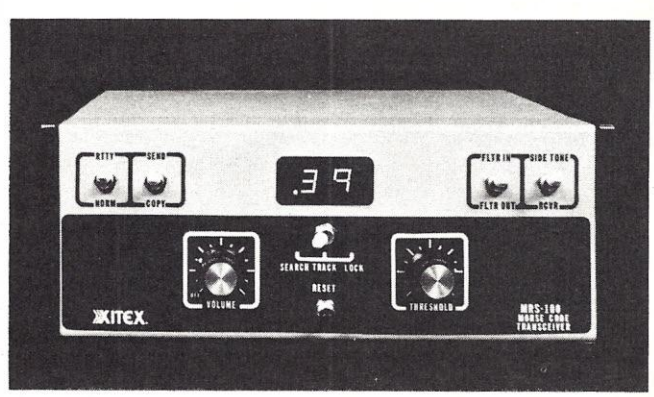
The RS-16-HP plugs into the Commodore PET's parallel I/O port and can be used for a wide variety of control applications. Using the PET's BASIC interpreter or programming directly in 6502 assembly language or even from the PET's interactive console, you can give commands to the RS-16 causing it to drive any one of 16 output devices or to sense the condition of 16 to 24 input devices.

Output devices can be any 6 volt or less ON/OFF mechanism using less than 1/4 Ampere. For example, lamps, LEDs, solenoids and dc motors are typically used. Erector set motors and Meccano gears sets are popular electromechanical devices for computer control hobbyists. Relay coils can be driven directly; by selecting a 6 volt relay with appropriate contacts, you can use the PET to control most appliances with manual switches, for example, R/C car handsets, model train switch boxes, stereos, garage door openers, etc.

Input devices can include TTL gates or any form of switch contacts, including thermostats, reed switches (as in burglar alarms and train detectors), microswitches (detecting closed doors), joysticks, keyswitches and numeric keypads. Each of these hooks directly to the RS-16, and the PET can read the switch for open or closed condition. Up to eight of these switches can be wired for fast operation; a switch closure can be "captured" and held until the PET recognizes it and then releases the stored data.

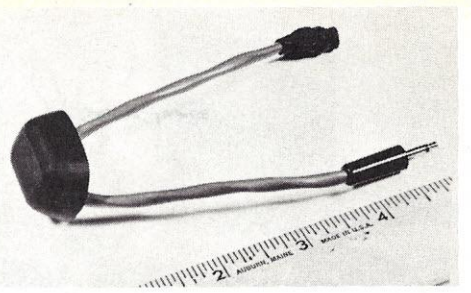
All output and input devices are wired through a single 44-pin connector, which is available at most electronics stores for about $3. A different connector can be used for each peripheral—one for a burglar alarm, one for an electric train set, etc.—so that a single RS-16 can be used for many peripheral systems.

The RS-16-HP comes completely assembled and tested, with an installation manual, for



The MRS-100 Morse Code Transceiver.

Heath's ID-4001.



TBUFF module for TRS-80.

$229. The installation manual, describing peripheral wiring and PET software, can be purchased separately at $6, with that amount refundable if the RS-16-HP is purchased later.

Cooper Computing, Box 16082, Clayton MO 63105.

Digital Weather Computer

Now you can be a man for all seasons with the ID-4001 Computerized Weather Station from Heath Company, Dept. 350-730, Benton Harbor MI 49022. The microprocessor-based ID-4001 indicates time, indoor and outdoor temperatures, wind speed and direction and barometric pressure on an upright display panel utilizing large LED readouts. It will also display average wind speed and automatically calculate wind chill factor as well.

The ID-4001's memory allows instant recall of date and time of maximum and minimum temperatures, wind gusts and barometric pressure. It can even indicate the barometric pressure's rate of change per hour and tell if it is rising or falling.

The ID-4001's six-digit time/date display shows time in hours, minutes and seconds and the date in month and day. The time/date can be displayed alternately, or either may be displayed continuously. The 12-hour time format has an AM-PM indicator.

A two-digit display shows wind speed in mph, kph or knots. A 16-indicator wind vector display, identified by compass points and radial degrees, indicates wind direction. The thermometer display indicates indoor or outdoor temperature in degrees F or C with + or − signs. A four-digit display shows barometric pressure in inches of mercury or millibars. Separate indicators show rising or falling pressure. Kit and assembled versions of the ID-4001 are available for $369.95 and $595, respectively.

The 6800-Based Chieftain

A new high-performance dual-floppy microcomputer, featuring SS-50 bus compatibility and a new controller design, has been introduced by Smoke Signal Broadcasting, 6304 Yucca St., Hollywood CA 90028. The new Chieftain microcomputer is a versatile, general-purpose system based on the 6800 microprocessor with 32K of static RAM.

Standard features include two serial I/O ports, two mini-floppies and the compatible DOS-68 disk operating system. Increased reliability is obtained through the use of gold connectors to eliminate continual re-seating of boards and a cooling fan to extend component life.

The new microcomputer allows up to 60K of usable memory with the addition of two more slots. Disk storage can also be increased to four mini-floppies or four 8-inch floppies. Price for the Chieftain is $2595.

Shake Those Microwelding Blues

You don't have to get hung up on a TRS-80 cassette drive hang-up. Untangle yourself with the TBUFF module from Web Associates.

If you are running a lot of data saves or loads on your TRS-80, during which the cassette is turned on and off several times a minute, then you are particularly vulnerable to microwelding, which occurs as a result of excessive current and heat buildup in the cassette control reed relay. The microwelding is further aided by a slight, self-holding, electromagnetic force induced by the high recorder current. This added electromagnetic force is why, in most cases, the hang-up goes away when the cassette is manually turned off.

Web Associates has a simple, inexpensive, non-repair-shop solution. The TBUFF module simply plugs in series with the REMOTE cable between the TRS-80 and the recorder. TBUFF significantly reduces the current passed through the reed relay in the TRS-80. At the same time, owing to careful design techniques, TBUFF delivers full power to the recorder, thus maintaining proper tape speed and volume levels. TBUFF sells for $7.95 (Californians, add 6 percent).

Web Associates, Box 60-N, Monrovia CA 91016.

6502 Assembler for PET

The 6502 Assembler in BASIC lets you write programs in assembly language for the 6502 microprocessor and have them translated to machine language for direct execution on the PET. The assembler accepts all standard 6502 instruction mnemonics, pseudo-ops and addressing modes and evaluates binary, octal, hex, decimal and character constants, symbols and expressions.

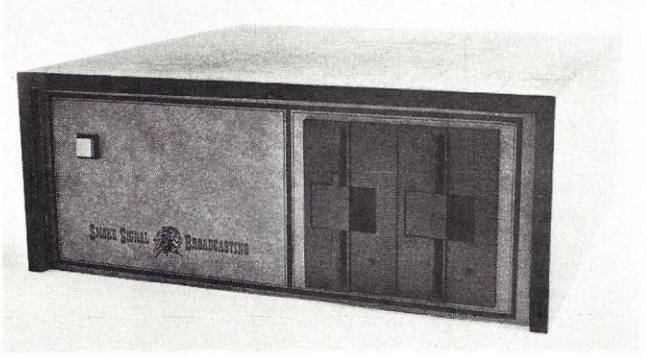
Source programs can be read from cassette, and object programs can be assembled anywhere in memory. The package includes both one- and two-pass versions of the assembler, a text editor and a disassembler, with a 30-page manual including PET machine-language programming hints. It is priced at $24.95.

Personal Software, PO Box 136, Cambridge MA 02138.

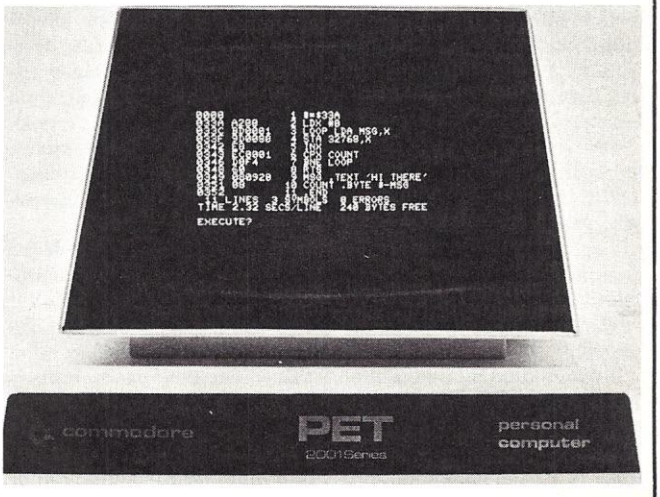
A-MUSE-ing Software

The MUSE (Micro Users Software Exchange) Company announces a complete line of software for the Apple II. A full feature text editor ($17.95) allows management of free-form text;

(continued on page 116)



SSB's Chieftain.



Assembler for the PET.

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3600A	50Hz - 600MHz	Oven .5 PPM 17° - 37° C	10MV	10MV	50MV	8	.5 Inch	115VAC or 8.2 - 14.5VDC	2⅛"H x 8"W x 5"D
3550W	50Hz - 550MHz	1 PPM 65° - 85° F	25MV	25MV	75MV	8	.5 Inch	115VAC or 8.2 - 14.5VDC	2⅛"H x 8"W x 5"D

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KB CLUB CALENDAR

Steve Fuller

Atlanta GA

The Atlanta Area Microcomputer Hobbyist Club has voted to change its name to the Atlanta Computer Society. Meetings are held in the Community Room of the Decatur Federal Savings and Loan Assn. (Dunwoody Branch), 1630 Mount Vernon Road, Dunwoody GA. Regular meetings are scheduled at 7:30 PM on the last Wednesday of each month. Visitors are welcome, and interested persons may write ACS, PO Box 88771, Atlanta GA 30338, for information on club activities.

Microware Newsletter

Microware Forum is the newsletter of a new users group for Microware products, which include the RT68 multitasking monitor and the ABASIC compiler.

The first issue will include adaptations of the compiler to CRT terminals, printers and the SWTP calculator card. The annual subscription rate is $10. Write Microware Forum, PO Box 3630, Minneapolis MN 55403.

Tampa FL

Officers of the Tampa Bay Computer Club include President Jack Stevens and Secretary Brian Sherritt. The club meets on the first and third Thursday of each month in the Science Center on the Dale Mabry Campus of Hillsborough Community College.

Write Tampa Bay Computer Club, PO Box 8004, Tampa FL 33604. In Tampa, call Jack at 988-1003 or Dave Smith at 961-2446. In Clearwater or St. Petersburg, call Kirk Bailey at 393-2161.

Holyoke MA

The address of the Western Mass Computer Club is 20 Morgan St., Holyoke MA 01040. The club secretary is Christopher Lyons.

San Jose CA

Persons interested in the use of microprocessors for tracking stock-market activity can write to Jim Finnell at 760 S. Saratoga Ave. Z 101, San Jose CA 95129, or call him at (408) 249-7977.

TRS-80 SIG

The Southeastern Michigan Computer Organization (SEMCO) is now sponsoring a special-interest group for TRS-80 users. Chairperson Dick Huebner says the group's main objective is to share ideas on programming, troubleshooting and new TRS-80 products.

For meeting locations and club activity information, write to SIG TRS-80, Box 37206, Oak Park MI 48237. Phone numbers are (313) 326-0386 (days) and (313) 548-5926 (nights).

Bedford MA

A sample of the special-interest groups sponsored by the New England Computer Society includes 6502, PET, M6800 and TRS-80 . . . a good start toward satisfying the most avid hobbyist!

For more information on this active club, write New England Computer Society, PO Box 198, Bedford MA 01730.

Mental Health and Micros

Marc Schwartz, MD, is the editor of Micro-Psyche, a bimonthly for professionals interested in microcomputers in the mental health field.

Offerings from a previous issue include hardware/software reviews for psychologists and psychiatrists, use of the microcomputer as a diagnostic tool and continuing bibliography on computers in mental health.

For a membership and subscription send $10 to Micro-Psyche, 26 Trumbull St., New Haven CT 06511.

Seattle WA

The Northwest Computer Club and the Pacific Science Center will co-sponsor the Second Annual Personal Computer Fair on March 10 and 11, 1979, at the Science Center in Seattle.

The show is specifically geared to acquaint the general public with personal, home and hobby computer applications, and features a variety of nontechnical demonstrations. There are numerous opportunities for hands-on experimentation.

Address inquiries to Susan Stocker, Pacific Science Center, 200 Second Ave. North, Seattle WA 98109, or call (206) 624-8140.

OSI Users Group

Owners and users of Ohio Scientific computers can share information, applications and software through an independent users group formed recently by the Newton Software Exchange in Newton MA. The group will encompass the full range of OSI products, with special attention given to the Challenger series.

Annual dues of $5 include a subscription to the group's monthly newsletter. Write Newton Software Exchange, PO Box 518, Newton Corner MA 02158.

TRS-80 Newsletter

The TRS-80 Club of Arlington (MA) is preparing a semiannual newsletter, free for an SASE. The group also has a word processing program available for the TRS-80. Write to them at 96 Dothan St., Arlington MA 02174.

VIM and AIM-65

The San Fernando Valley KIM-1 Users Club is broadening its base to include users of VIM and AIM-65 systems, according to club president Jim Zuber.

Write SFV KIM-1 Users Club, 20224 Cohasset No. 16, Canoga Park CA 91306.

This column is available for you to report on your club's activities such as regular meeting schedules, special events or programs, swap meets or any endeavor that will be of interest to your fellow hobbyists. If your announcement contains timely information, please send it at least two months prior to the date or dates mentioned in the announcement.

Kilobaud Club Calendar
c/o Steve Fuller
334 Sterling St. Unit A-3
West Boylston MA 01583

Contest!

With this issue, we inaugurate the second year of our "best article of the month" contest. To vote, simply turn to the reader-service card at the back of the magazine.

The winner for October 1978 was Emerson Brooks, author of "Let Your Computer Wear a Watch." Our congratulations to Emerson.

In a drawing of all votes submitted, that of Tom Simon of Chalfont PA was chosen; Tom wins a book from the KB Book Nook.

If you have the December 1978 issue handy, turn to page 79. There you'll find a ballot listing the 12 articles selected as best of each month for the first year of the contest. If you haven't already done so, mark on the December reader-service card in the alloted space the month of the issue that contains your vote for best article of the year. Deadline for submission of votes is January 1, 1979.

LETTERS

Thinking Big about Small Business

I've been an avid reader of *Kilobaud* since the first issue and have been impressed by the down-to-earth and simple approach it has taken. The format has proved to be understandable and interesting, and the Instant Software service should be a smash if it offers complete documentation and well-engineered and tested software.

However, I'm afraid that *Kilobaud* may have chosen, by content and format, a limited marketplace: enthusiast only. That market is now probably peaking out, after the significant inroads accomplished by the $600 micro.

Enthusiasts probably only exist in the hundreds of thousands. Although this may seem like a huge quantity, it is dwarfed by the millions of very small businesses that *should be* the real marketplace for the microcomputer and its supporting industries.

Let me explain what I mean by the term "very small business." I'm *not* talking about the small business with a large information problem, such as a distributor with large and volatile inventory; nor the profession whose business is information, such as accounting; nor the large-size small business that probably has a full accounting and control section already, such as the dental clinic or the larger retailer. These businesses are just waiting for the day they can afford the right computer. Their complex problems require complex solutions, and they will be attacked in full force—by Alpha Microsystems and its competitors with scaled-down (only slightly) versions of mini and maxi-computer systems.

What I'm really talking about is "the little guy," the business that only needs *help* from the computer and doesn't want to be overwhelmed by technology. This businessman got into his business because he likes what he does. At best he has office help, but it is inexpensive and relatively unskilled in accounting and information handling. He may still even carry his receipts and paperwork to his accountant in a shoe box, anxiously waiting to find out if he made a profit or is going bankrupt. This businessman has already had the enjoyment of his work infringed upon by overhead, inventory control, lost order, overstocks, out-of-stocks and organization problems.

When he looks for help, it has to *simplify* his life, not complicate it further or enslave him to a machine. He will have to be able to see the computer as a new tool and friend, just like a typewriter, calculator or cash register, ready to help him improve his profit margin without taking the fun away.

This is where my worries take on frightening proportions. Are we really going to be able to give him what he wants or will he be led on a wild-goose chase, trying this, that and the other thing, until he gets fed up and washes his hands of this "computer thing" completely? (Remember the CB radio, and look at the shelves full of them now.)

I think we *can* give him what he wants, but we're really going to have to get our act together. Systems are going to have to be simple and understandable, not scaled-down complexities. They will also have to be very simple to operate, not scaled-up computer games.

This will require reaching out and meeting the small businessman on his own ground, with specific solutions to his specific problems. Simplicity, reliability, and my own term, friendliness, will be the key ingredients. If he understands it (simplicity) he'll tell his friends; if it rarely breaks or fails (reliability) he'll think about new uses; and if he likes it and doesn't feel threatened by it (friendliness) he'll enjoy his work and make a profit.

This means that we are going to have to learn his problems and develop relevant solutions. We won't be able to make him think like a programmer, requiring input such as: "ENTER PAYROLL INFO? 136721,080,065,L, 1,2,A" and we can't force him to do cost accounting when he doesn't want it, or keep an inventory on only ten items.

We are going to find that each small business will insist on its own answers and its own specific needs and differences. I know we have a challenge ahead. But, I think we have a chance to make it successful. It's just going to take a lot of work and a lot more understanding of the problem.

Larry D. Soderberg
VIS Group
San Luis Obispo CA

Thanks for an interesting letter, Larry. Not only am I aware of the drop in interest in hobby computing, I predicted it. This is why I have been encouraging the writing of business-oriented articles for Kilobaud. *My intention is* not *to turn* Kilobaud *into a small-business computer magazine, but to lay the groundwork for starting a separate magazine for that market. I see* Kilobaud *as a magazine for the hobbyist and the person, businessman or no, who wants to learn more about microcomputers. I see it as a step above publications written for those not really interested in learning more about the hardware and programming.*

As sales of TRS-80 systems are proving, there are a lot of people who want to use and enjoy computers, but without the commitment of having to learn the intricate electronics and a host of programming languages. Until we are able to find people who want to work on a magazine about such electronics and programming intricacies, we'll aim at taking care of the above users and enjoyers to some degree, with Kilobaud.

What kind of articles are needed? We need evaluations of hardware and software from a business point of view, written in English, not computerese. With a new hardware system being announced almost every week, how can businessmen know what each can do or why they should buy them? And now that the first trickle of business-oriented software is coming in sight, how are we to know what can do what without some in-depth reviews by people who are trying to use it in business environments?—Wayne.

What's Up, DOC?

Don Fitchhorn's DOCUFORM article in the August 1978 Kilobaud *has elicited much comment, nearly all of it favorable. One commonly asked question was whether or not there was any code missing betwen lines 390 and 980 of the program listing. The answer is no; DOCUFORM is complete as published in* Kilobaud. *A bug did creep into the listing, however, and Don takes care of it below. He also expounds a bit on the AUTO DOC routine.—The Editors.*

DOCUFORM could have been the best program I've ever seen in *Kilobaud*. Would you please explain AUTO DOC subroutine 550?

Charley Butler
Lansing MI

In response to Mr. Butler's letter: The subroutine title states that this is the GET A LINE routine, and that is just what it does. This sub could have simply been the statement: 550 PRINTCHR-$(7);:LINEINPUT B$:GOTO 700. But I wanted to control how the delete (or rubout) key worked —<670,680>. Also, because tab characters in text are hard to work with, I wanted to replace them with the correct number of spaces—<610>. And last, the column scale would not have worked very well. These three features that I wanted required that I perform my own "LINE-INPUT."

Explaining just how this routine works would require several pages. Instead, I will offer a few hints so that (if necessary) you can sit down and figure it out yourself. OUT17,X puts the ASCII character corresponding to the value of X out to the terminal. X = INT(17) puts the ASCII value of the character just typed into X. WAIT16,1 stalls the computer until a character is typed.

I hope that this helps some.

Donald L. Fitchhorn

The purpose of this letter is to comment on the dictionary file scheme of DOCUFORM by Donald L. Fitchhorn. First, I want to commend Mr. Fitchhorn for a fine program, and especially for the hash-coded dictionary. I recommend careful study of this code to any programmer who may have a need for efficient keyword index files for any application. A hash-coded index, such as the one in DOCUFORM, is far more efficient than any sorting scheme, and once the principle is understood, it can easily be coded by using the DOCUFORM program as a model. I also thank Mr. Fitchhorn for including the variable glossary in his article—it makes study of the program much easier.

The DOCUFORM dictionary code, as published, contains a few errors. These are mostly in the record overflow handling part of the code, and therefore would

```
5580 IF G$="DICTNARY"THEN AA=CVI(AA$):AB=CVI(AB$):GOTO5590
     ELSE LSETG$="DICTNARY":LSETAA$=MKI$(102):LSETAB$=MKI$(0):PUT4,1:
     LSETR$=CHR$(126):LSETRR$=MKI$(0):FORM=2TO102:PUT4,M:NEXT:GOTO5590
2540 G$=MID$(R$,1,INSTR(R$,CHR$(126))-1)
2550 IF LEN(G$)+LEN(F$)<127
        THEN LSETR$=G$+F$:PUT#4,P1:
             GET4,1:AB=AB+1:LSETAB$=MKI$(AB):PUT4,1
             GOTO2460
2560 AA=AA+1:LSETRR$=MKI$(AA):PUT#4,P1:LSETR$=F$:LSETRR$=MKI$(0):PUT#4,AA:
     AB=AB+1:GET#4,1:LSETAA$=MKI$(AA):LSETAB$=MKI$(AB):PUT#4,1
```

Example A.

```
        DELAY   LDX #$F8    Load 248 Dec.
        C1      DEX         2 cycles
                BNE C1      3 cycles   Total 5 cycles
```

Example 1.

```
008A  A2C7    DELAY  LDX #$C7    Delay for 1 millisecond
```

Example 2.

not soon show up in normal usage. Statistically, about 700 to 800 long English words would have to be entered into this dictionary before the first overflow would occur. For those readers not familiar with the statistics of hash-coding, one of the advantages is that the initial file space has to be nearly filled before any overflow becomes probable, if randomly chosen words are entered.

Sylvan Rubin
Santa Clara CA

When I received Sylvan Rubin's letter, I was surprised. I knew that this problem had already come up and had been fixed. On looking back at the old listings, I found that only part of the fix had actually gotten into the program. Apparently, this is a case of being called way from an editing session and upon return (finding that everything seemed to work OK) deciding that I had gotten farther than I thought. My apologies to all of you who are using the program.

To fix the problem stated in the letter, the changes in Example A should be made. Changes are underlined.

Further correspondence on DOCUFORM may be addressed directly to me at 2475 Calle Pino, Thousand Oaks CA 91360. For $5 I will send a listing of the latest version of DOCUFORM with all bug fixes noted.

Donald L. Fitchhorn

Afterthoughts

With reference to the "Do It with a Kimsi" article in the November 1978 issue, we would like to clear up one point that may cause some confusion. The Kimsi board was designed to plug directly onto KIM's expansion connector using the "back-to-back" connectors that are available for this purpose. A 6-8 inch cable may optionally be fabricated between the two units as the user wishes. The suggestion to lower the clock speed of the KIM applies ONLY to users who must use cables longer than 8 inches; absolutely no modifications to KIM are needed for normal use with Kimsi. We should also note that the Kimsi *does* fully buffer the address and data lines, both to the S-100 bus, and to the KIM.

With the KIM-1 now only $179, a complete Kimsi system can be put together for considerably less than mentioned in the article. Of course, the real value in a Kimsi system is the instant S-100 expansion that isn't available in "all-in-one" machines.

As we have just moved to new facilities, correspondence should be sent to the address below rather than the one in the article.

Forethought Products
87070 Dukhobar Road
Eugene OR 97401

Leonard Crane
Forethought Products

Just received the November issue. After checking out my article on page 60 I found a "BOO-BOO." I made an error in the original copy. The statement "This was necessary because there is no buffering in the Kimsi of the address and data lines going to KIM" should read, "This was necessary because there is no buffering in the KIM of the address and data lines going to the Kimsi." The Kimsi does have adequate buffering on its board, and I would like pass this information along to the readers.

Rick Grossman
Lompoc CA

PROM 'n' Aid

In the September 1978 issue of *Kilobaud* I noted "Super Cheap 2708 Programmer" by James Grina.

This is a good article and the type I am looking for. It was also timely since I had decided to do a 2708 and also an 8748 programmer using the KIM-1.

In studying the program listing in order to make a few minor changes (such as programming by the page), I focused on the 1 millisecond delay (line 008A). It seems to me that an assumption was made that the delay loop required 4 microseconds to complete. I don't always count cycles, but this loop should take 5 microseconds. I have seen a similar assumption in other programs, so I think this should be resolved (see Example 1).

The thing here is that 1 cycle is added when a branch is made to the same page. Since this is done each time the program loops, 3 cycles are required for the BNE. Line 008A should read as in Example 2.

Charles H. Parsons
Monroe CT

You should be advised that the foil pattern appearing with "Super Cheap 2708 Programmer" by James Grina in the September 1978 *Kilobaud*, page 101, contains several errors because of missing traces.

The trace supplying power to IC4 is missing. A trace equivalent to those to pin 11 on the other 75193s is missing on IC3 and is needed to guarantee pull-up.

Whether the author's fault or *Kilobaud's*, I found the failure to orient the parts placement with a "ghost" of the foil pattern to be very confusing.

The concept seems useful and I am adapting the circuit to wire-wrap with connectors to my KIM, which uses DIP cables for the multipurpose parts.

Mike Firth
Dallas TX

Mike Firth was right about the missing trace on IC4 and the pull-up. Also, there are two lines of code missing. Several other readers wrote to tell me this and that there are two lines of code missing in the program. I have enclosed the corrections. By the way, the errors were mine; I failed to notice them in my proof of the article.

PS. The "ghost" would be a good idea, but I don't have the know-how.

Jim Grina
St. Paul MN

Code Correction

```
0056   CE   02   17
0059   20   90   00
005C   90   E9
005E   F0   EA
```

Can America Go Metric?

I enjoyed the September 1978 article on "metric-American conversion" (p. 46). However, I discovered a few mistakes in the conversion formulas Mister Ferguson used. I have included a list of formulas that have been checked against college and commercial conversion tables for accuracy.

```
0450  M=K/1.6093440
0500  F=M/0.30480
0550  I=C/2.540
0600  K=M*1.6093440
0650  M=F*0.30480
0700  C=I*2.540
0890  M=K/2.58998811
0940  F=M/0.09290304
0990  I=C/6.451600
1040  K=M*2.58998811
1090  M=F*0.09290304
1140  C=I*6.451600
1330  I=C/16.387064
1380  F=M/2.831684659 E-02
1430  G=L/3.785411784
1480  C=I*16.38706400
1530  M=F*2.831684659 E-02
1580  L=G*3.785411784
1770  O=G/28.34952313
1820  P=K/.45359237
1870  T=M/.90718474
1920  G=O*28.34952313
1970  K=P*.45359237
2020  M=T*.90718474
```

(All numbers are given to ten significant figures.)

John H. Richardson, Jr.
New York NY

The letter from Mr. Richardson is the second I have received about apparent errors in the metric-American conversions.

As to the accuracy of the conversions, I am by no means an authority on the metric system. So I simply took the conversion formulas from *The Calculator Handbook* by A. N. Feldzamen, PhD, and Faye Henle, which happened to be sitting on my desk. I've double-checked the conversion formulas in the article against *The Calculator Handbook* and they agree. Since I do not have either college or com-

mercial conversion tables, *Handbook* was my best source. I simply assumed Feldzamen & Henle had done their homework.

The number of significant digits used in the conversion formulas was that which was given in the *Handbook* and should be sufficient for most personal-computer applications. After all, Mits 8K BASIC has only six significant digits, and SWTP BASIC has nine.

I do hope this has not caused anyone any serious inconvenience. If so, I am very sorry. I also offer an apology, if necessary, on behalf of *The Calculator Handbook* people.

Mickey Ferguson
Trenton GA

A Blow for Standardization

Thank you for publishing my article about a BASIC program for copying Morse code in the November 1978 issue (p. 34). I have been contacted by many hams who have operated the program successfully.

However, I have discovered that some versions of BASIC have differences from the Microsoft BASIC in which the program was written. Specifically, in Microsoft BASIC if there are multiple statements on a line separated by a colon (:), and if the first IF statement is not satisfied, the rest of the statements are not executed. In some other versions of BASIC, the rest of the statements are executed.

In the program, the line in Example a appears. For non-Microsoft BASIC users, the changes in Example b should be made.

The simple addition of line 25 and the minor modification of line 30 takes care of all variations of BASIC. Anyway, another blow is pounded for the need for standardization.

Robert Kurtz
Rolling Hills CA

"Action" . . . Elucidation

Robin McDaniel of Oswego IL and Roger S. Hicks of Atlanta GA (among others) indicated that they had problems with the program in "Action on the Enterprise" (October 1978, p. 78). Following is a letter from the author, Ed Juge, regarding the program.

Regarding "Action on the Enterprise": I have been through the program a couple of times and have talked to several people who have called on the phone. The mistakes I have found are as follows.

1. Line 200—there should be a comma following "P.A.710"

2. Line 2252—this line number appears twice. The second line should read "2255 N.B"

3. Line 4040—there should be only a comma following the second A. (There are a period and comma following that A.) The beginning of the line should read 4040 P.A. A, "*"

Regarding the note by Robin McDaniel and the comment that line 334 should have "Y=83" (my program reads X=83): I do not agree with that comment.

Ed Juge
Burleson TX

```
30 IF A=1 THEN C=((5*C)+(2*B))/6:DO=2*DO:DA=2*DA:DO=DO+1:GOTO 100
```

Example a.

```
25 IF A=0 THEN 40
30 C=((5*C)+(2*B))/6:DO=2*DO:DA=2*DA:DO=DO+1:GOTO 100
```

Example b.

Reader Responsibility

One of your responsibilities, as a reader of *Kilobaud*, is to aid and abet the increasing of circulation and advertising, both of which will bring you the same benefit: a larger and even better magazine. You can help by encouraging your friends to subscribe to *Kilobaud*. Remember that subscriptions are guaranteed—money back if not delighted, so no one can lose. You can also help by tearing out one of the cards just inside the back cover and circling the replies you'd like to see: catalogs, spec sheets, etc. Advertisers put a lot of trust in these reader requests for information. To make it even more worth your while to send in the card, a drawing will be held each month and the winner will get a lifetime subscription to *Kilobaud*!

Ring in the new year with resolutions of responsible readership, and you may find yourself in the same position as James S. Conger of Modesto CA. James has won a lifetime subscription to *Kilobaud* in our latest drawing.

PUBLISHER'S REMARKS

(from page 8)

there must be an alternative to the printer as a means of keeping a permanent record of data. Sure, for a few hundred dollars you can buy a screen printer for the TRS-80 and run off a print of records for use as an audit trail later on. But why get into the paper-filing business if you really don't have to?

Most audit-trail records are never needed . . . they are kept "just in case." So why put them on sheets of paper and file them for such an iffy use? How about getting your data on your TRS-80 screen and shooting it with a 35 mm camera on black and white film . . . and then having a contact print made of each 36 pages of records? In this way 36 pages would be on one 8 x 10 contact print. Sure, you'll have to use a magnifying glass to read the tiny print, but remember that this is for emergency use.

If you get into a spot where you need to use the records and don't want to bother with the magnifying glass you can trot out a 35 mm projector and look at 'em . . . or even have enlargements made.

PET-POURRI

(from page 11)

PET Problems

If your PET has a problem, take it to your dealer; he is authorized for repairs. If you bought it directly from Commodore, ship it back to them for repairs. Use the original container, but add more solid cushioning, such as newspapers, especially in the corners. Don't use small pieces of Styrofoam. Ship it via UPS to: Commodore, Customer Services, 901 California Ave., Palo Alto CA 94304. Commodore's customer-services phone number is (415) 327-4030.

By now every PET owner should have received a revised PET user manual, a booklet titled "PET Communication with the Outside World," two programs, "Squiggle" and "Bigtime," on a cassette tape, including a booklet explaining the programs, and a machine-language monitor on cassette with a booklet explaining how to use it. If you did not receive yours, write to inquire if your name was left off the list.

To function reliably your tape heads should be properly aligned, cleaned and demagnetized every ten hours of use. It is possible that 30 percent of the PETs have misaligned tape heads when received. Aligning them is quite touchy and should be done by a trained technician. Cleaning your tape heads is a simple matter. Just dip a cotton swab in some tape-head cleaner (or alcohol) and gently clean the tape-head surface, which contacts tape as well as the rollers. Let it completely dry before using a tape.

Demagnetizing your tape heads is also easy, but requires a "Demagnetizer." These can be purchased at most stereo stores for under $10. Make sure that no cassettes are within five feet of the demagnetizer or they can be ruined. Turn on the demagnetizer three feet away from your tape heads and slowly bring the tip of it towards the heads until you gently touch them. Now slowly bring the demagnetizer away from the recorder. Don't turn it off until you are three feet away again.

Well, that's it for the first installment. I look forward to producing future columns, and I look forward to hearing from PET owners, users and readers interested in the PET microcomputer. Please address all correspondence—questions, problems, suggestions, news, etc.—to:

Len Lindsay
Microcomputer Resources Ctr.
1929 Northport Dr., Rm. 6
Madison WI 53704

Our instructor, Pete Stark, is on "sabbatical" this month, so we're presenting a couple of articles by Pete in lieu of Klassroom No. 16, which will appear next month.—Editors.

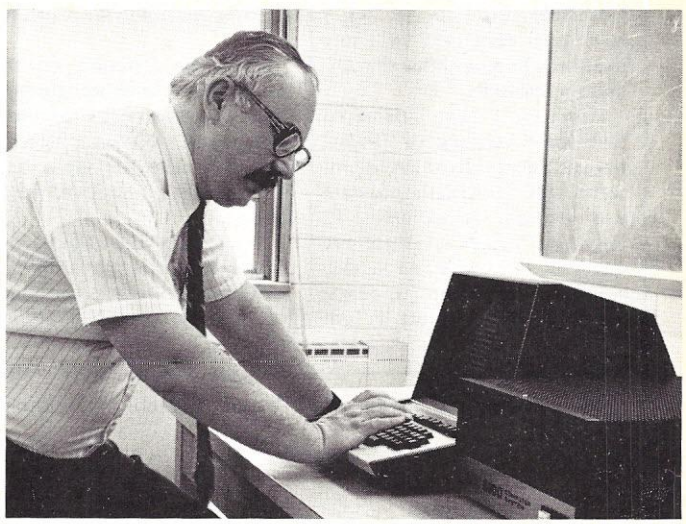
An Editor for 6800 BASIC Programs

This is one of the most significant and useful pieces of software owners of SWTP systems will see in quite some time (especially those who do a lot of programming in BASIC).

Peter A. Stark
PO Box 209
Mt. Kisco NY 10549

Considering the difference in price between a small computer such as the SWTP 6800 system, and a large computer such as an IBM 370 or PDP-10, the small-computer BASIC systems are remarkably capable in comparison. There has been a tremendous improvement in the last year or so in the power of microcomputer BASICs, including even various formatted outputs and cassette and disk routines. But there is one area in which the big-computer BASIC systems outshine the small—the facility to edit the BASIC source program easily and quickly. Here are two programs for the SWTP system that help with the editing job.

The two programs are called BASEDIT and BASLIST. There are overlapping areas between the two; they could probably have been combined into one larger program, but I chose to separate them because I could not assemble them together in my 16K system.



Pete Stark . . . hard at it.

Program 1. BASEDIT program.

```
00010                          NAM    BASEDIT
00020                  *BASIC EDITOR
00030                  *P. STARK 2/78
00040 0100                     ORG    $0100
00050                          OPT    O
00060                  *ROM ENTRY POINTS
00070       E1AC       INEEE   EQU    $E1AC
00080       E1D1       OUTEEE  EQU    $E1D1
00090       E0E3       CONTRL  EQU    $E0E3
00100                  *HARD/SOFT STARTS
00110 0100 7E 0106     HARDST  JMP    START
00120 0103 7E 012A     SOFTST  JMP    ASK
00130 0106 CE 0103     START   LDX    #$0103
00140 0109 FF A048             STX    $A048
00150 010C 8E A042             LDS    #$A042
00160                  *START WITH LF
00170 010F 86 0A               LDA A  #$0A
00180 0111 B7 0498             STA A  TEXT
00190 0114 CE 0499             LDX    #TEXT+1
00200 0117 8D 43               BSR    CRLF
00210 0119 BD E1AC READ        JSR    INEEE
00220 011C A7 00               STA A  0,X
00230                  *EXIT ON CTRL E
00240 011E 81 05               CMP A  #$05
00250 0120 27 08               BEQ    ASK
00260 0122 08                  INX
00270 0123 FF 0128             STX    LAST
00280 0126 20 F1               BRA    READ
00290 0128 0002    LAST        RMB    2
00300                  *ENTER COMMAND
00310 012A 8E A042 ASK         LDS    #$A042
00320 012D 8D 2D               BSR    CRLF
00330 012F 86 3E               LDA A  #'>
```

Both programs take as their input a cassette tape of the BASIC source program in the format produced by Version 2.0 (and possibly later versions) of the SWTP 8K BASIC. BASEDIT allows editing of the program and then produces a new cassette (or listing) in the same format, so that the program can be fed back into the BASIC interpreter. BASLIST reads a tape and produces a neatly formatted listing separated into pages, each of which is numbered and has an optional program title.

The BASEDIT Program

BASEDIT is a machine-language program that lies in locations 0100 through 0497 hex, and uses the rest of memory, from location 0498 hex up through the limit of RAM, to store the BASIC source program to be edited. It has a starting address of 0100 hex, and a 0103 soft-start address that allows BASEDIT to be restarted without erasing the BASIC program from memory.

When BASEDIT is started at the hard-start address of 0100, it immediately goes into its read mode, where all characters entered from the keyboard or tape are stored into memory in the text buffer. Normally, you would start BASEDIT at 0100,

either by loading A048 with 0100 and then typing G with MIKBUG, or typing J 0100 for SWTBUG. BASEDIT then does a carriage return and waits for text. At this point, you should switch to cassette input, and load a standard BASIC program exactly as it was recorded by the BASIC interpreter with its SAVE command.

BASIC programs in this format consist of a chain of 00 (Null) codes, a set of BASIC statement lines, an end code using a 03 code (ETX or Ctrl-C) and another string of 00 (Null) codes. Each line, consisting of 02 (STX or Ctrl-B), a four-digit line number, one space and the BASIC source text, is output by the interpreter in line-number order. This is the format BASEDIT needs.

When the source program is finished reading, turn off the cassette and switch back to keyboard input, and enter a Ctrl-E from the keyboard (hex 05) to signify the end of the program. BASEDIT then goes into the command mode, prints a > and waits for a command.

There are five possible editing commands; each is a single letter (E, P, F, R or S) possibly followed by one or two arguments.

1. *E.* Typing an E (Exit) returns control to MIKBUG or SWTBUG. BASEDIT leaves an address of 0103 in A048 and A049, so the program can be restarted either by typing G or J 0103. Either way, the program being edited will remain. If a new program is to be entered, then BASEDIT should be restarted at 0100.

2. *P.* Typing the P command (for Print) outputs the BASIC text as it has been stored or modified. The output begins as soon as the P is entered, without any intervening delays; it is assumed that the null characters read in from the source tape will provide the necessary delays before and after the text.

The P command can be used to simply print out the program, or, if the cassette recorder is on, then the program will be written to cassette in a format suitable for reading into the BASIC system with the LOAD command. To stop output in the middle of the program, simply press the reset button on the computer's front panel, and then restart from location 0103.

3. *F.* Typing the letter F (for Find), followed by a string of up to 40 characters, will print out all lines in the text that contain that string. The string must be preceded and followed by a delimiter character, which may be any character on the keyboard except for a carriage return (CR) or any character that appears in the string itself.

For example, the command F .PRINT. prints out all lines that contain the string PRINT; in this case the delimiter is a period. Since any character can be a delimiter, typing F XGOTOX prints out all lines that contain the string GOTO; in this case an X is the delimiter.

The Find command can also be used to print out specific lines or sections of the BASIC program being edited. Since each line of the BASIC program starts with a Ctrl-B character, followed by a four-digit line number, this can be part of the string to be found.

For instance, entering the command F 'b0140' (where b stands for Ctrl-B) prints out only line 0140 of the source program. Or, the command F 'b05' prints out all lines whose line numbers start with 05, that is, lines 0500 through 0599. This is, of course, most useful if the keyboard can generate the Ctrl-B code; if not, then more lines will be printed. For instance, the command F '0140' prints out not only line number 0140, but also all other lines which contain the string 0140.

4. *R.* The command R stands for Replace, and it allows any string to be replaced by another string throughout the program. The format for the R command is: R, a delimiter, the first (old) string, the same delimiter, the second (new) string and the same delimiter again. The delimiter follows the same rules as in the F command, and the two strings together may not exceed 40 characters. The two strings need not be the same length; the second string

```
00340 0131 BD E1D1          JSR    OUTEEE
00350 0134 8D 31            BSR    SPACE
00360 0136 BD E1AC          JSR    INEEE
00370 0139 81 50            CMP A  #'P
00380 013B 26 03            BNE    NOTP
00390 013D 7E 0201          JMP    PRINT
00400 0140 81 46    NOTP    CMP A  #'F
00410 0142 26 03            BNE    NOTFIN
00420 0144 7E 0218          JMP    FIND
00430 0147 81 52    NOTFIN  CMP A  #'R
00440 0149 26 03            BNE    NOTR
00450 014B 7E 0246          JMP    REPLAC
00460 014E 81 53    NOTR    CMP A  #'S
00470 0150 26 03            BNE    NOTS
00480 0152 7E 02EF          JMP    SEQUEN
00490 0155 81 45    NOTS    CMP A  #'E
00500 0157 26 D1            BNE    ASK
00510 0159 7E E0E3          JMP    CONTRL
00520                  *CR/LF PRINT SUBR
00530 015C 86 0D    CRLF    LDA A  #$0D
00540 015E BD E1D1          JSR    OUTEEE
00550 0161 86 0A            LDA A  #$0A
00560 0163 BD E1D1          JSR    OUTEEE
00570 0166 39               RTS
00580                  *PRINT SPACE SUBR
00590 0167 86 20    SPACE   LDA A  #$20
00600 0169 BD E1D1          JSR    OUTEEE
00610 016C 39               RTS
00620                  *READ STRING SUBR
00630 016D BD E1AC  READST  JSR    INEEE
00640 0170 11               CBA
00650 0171 27 09            BEQ    EXITRS
00660 0173 81 0D            CMP A  #$0D
00670 0175 27 05            BEQ    EXITRS
00680 0177 A7 00            STA A  0,X
00690 0179 08               INX
00700 017A 20 F1            BRA    READST
00710 017C 39       EXITRS  RTS
00720                  *FIND STRING SUBR
00730 017D A6 00    FINDST  LDA A  0,X
00740 017F B1 01C4          CMP A  STRING
00750 0182 27 09            BEQ    FOUND1
00760 0184 08       FCONT   INX
00770 0185 BC 0128          CPX    LAST
00780 0188 26 F3            BNE    FINDST
00790 018A C6 00            LDA B  #0
00800                  *B=0 IF NOT FOUND
00810 018C 39               RTS
00820                  *FOUND 1ST CHAR; CHECK MORE
00830 018D FF 01BE  FOUND1  STX    SAVEX
00840 0190 FF 01C0          STX    TEMPS0
00850 0193 CE 01C4          LDX    #STRING
00860 0196 FF 01C2          STX    TEMPST
00870 0199 FE 01C0  FLOOP1  LDX    TEMPS0
00880 019C A6 00            LDA A  0,X
00890 019E 08               INX
00900 019F FF 01C0          STX    TEMPS0
00910 01A2 FE 01C2          LDX    TEMPST
00920 01A5 E6 00            LDA B  0,X
00930 01A7 08               INX
00940 01A8 FF 01C2          STX    TEMPST
00950 01AB 11               CBA
00960 01AC 26 0B            BNE    NOTF
00970 01AE BC 01EC          CPX    SPOIN1
00980 01B1 26 E6            BNE    FLOOP1
00990 01B3 FE 01BE          LDX    SAVEX
01000 01B6 C6 01            LDA B  #1
01010                  *B=1 IF FOUND
01020 01B8 39               RTS
01030 01B9 FE 01BE  NOTF    LDX    SAVEX
01040 01BC 20 C6            BRA    FCONT
01050 01BE 0002     SAVEX   RMB    2
01060 01C0 0002     TEMPS0  RMB    2
01070 01C2 0002     TEMPST  RMB    2
01080 01C4 0028     STRING  RMB    40
01090 01EC 0002     SPOIN1  RMB    2
01100 01EE 0002     SPOIN2  RMB    2
01110                  *GET DELIM & STRING SUBR
01130 01F0 BD 0167  DELIM   JSR    SPACE
01140 01F3 BD E1AC          JSR    INEEE
01150 01F6 16               TAB
01160 01F7 CE 01C4          LDX    #STRING
01170 01FA BD 016D          JSR    READST
01180 01FD FF 01EC          STX    SPOIN1
01190 0200 39               RTS
01200                  *PRINT TEXT
01210 0201 BD 015C  PRINT   JSR    CRLF
01220 0204 CE 0498          LDX    #TEXT
01230 0207 A6 00    PLOOP   LDA A  0,X
01240 0209 BD E1D1          JSR    OUTEEE
01250 020C 08               INX
01260 020D BC 0128          CPX    LAST
01270 0210 26 F5            BNE    PLOOP
01280 0212 BD 015C          JSR    CRLF
01290 0215 7E 012A          JMP    ASK
01300                  *FIND DESIRED STRING
01310 0218 8D D6    FIND    BSR    DELIM
01320 021A BD 0167          JSR    SPACE
01330 021D CE 0493          LDX    #TEXT
01340 0220 BD 017D  FLOOP   JSR    FINDST
01350 0223 5D               TST B
01360                  *QUIT IF NOT FOUND
01370 0224 26 03            BNE    LOOKLF
01380 0226 7E 012A          JMP    ASK
01390                  *BACKSPACE TO LF
01400 0229 09       LOOKLF  DEX
01410 022A A6 00            LDA A  0,X
01420 022C 81 0A            CMP A  #$0A
01430 022E 26 F9            BNE    LOOKLF
```

```
01440 0230 BD 015C        JSR    CRLF
01450 0233 08             INX
01460                *PRINT TO NEXT LF
01470 0234 A6 00    FPRLP LDA A  0,X
01480 0236 81 0A          CMP A  #$0A
01490 0238 27 E6          BEQ    FLOOP
01500 023A BD E1D1        JSR    OUTEEE
01510 023D 08             INX
01520 023E BC 0128        CPX    LAST
01530 0241 26 F1          BNE    FPRLP
01540 0243 7E 012A        JMP    ASK
01550                *SUBSTITUTE NEW STRING
01560 0246 8D A3    REPLAC BSR    DELIM
01570 0248 BD 016D         JSR    READST
01580 024B FF 01EE REPL2   STX    SPOIN2
01590 024E BD 0167         JSR    SPACE
01600 0251 4F              CLR A
01610 0252 8D 13           BSR    CALCDF
01620 0254 CE 0498         LDX    #TEXT
01630 0257 BD 017D RLOOP3  JSR    FINDST
01640 025A 5D              TST B
01650 025B 27 07           BEQ    GOASK
01660 025D 8D 1A           BSR    SWITCH
01670 025F FE 01BE         LDX    SAVEX
01680 0262 20 F3           BRA    RLOOP3
01690 0264 7E 012A GOASK   JMP    ASK
01700                *SUBR TO COMPARE STRING LENGTHS
01720 0267 4A       CALCDF DEC A
01730 0268 09              DEX
01740 0269 BC 01EC         CPX    SPOIN1
01750 026C 26 F9           BNE    CALCDF
01760 026E 4C       RLOOP2 INC A
01770 026F 09              DEX
01780 0270 BC 01C4         CPX    #STRING
01790 0273 26 F9           BNE    RLOOP2
01800 0275 B7 02E6         STA A  COMPAR
01810 0278 39              RTS
01820                *SUBROUTINE TO SWITCH OLD FOR NEW
01830 0279 B6 02E6 SWITCH LDA A  COMPAR
01840 027C 27 44           BEQ    SAME
01850 027E 2A 21           BPL    SHRINK
01860                *NEW STRING LONGER
01870 0280 40       STRETC NEG A
01880 0281 B7 028A         STA A  MOVETO+1
01890 0284 FE 0128         LDX    LAST
01900 0287 E6 00    RLOOP4 LDA B  0,X
01910 0289 E7 00    MOVETO STA B  0,X
01920 028B 09              DEX
01930 028C BC 01BE         CPX    SAVEX
01940 028F 26 F6           BNE    RLOOP4
01950 0291 BB 0129         ADD A  LAST+1
01960 0294 B7 0129         STA A  LAST+1
01970 0297 B6 0128         LDA A  LAST
01980 029A 89 00           ADC A  #0
01990 029C B7 0128         STA A  LAST
02000 029F 20 21           BRA    SAME
02010                *NEW STRING SHORTER
02020 02A1 B7 02A8 SHRINK STA A  MOVEFR+1
02030 02A4 FE 01BE         LDX    SAVEX
02040 02A7 E6 00    MOVEFR LDA B  0,X
02050 02A9 E7 00           STA B  0,X
02060 02AB 08              INX
02070 02AC BC 0128         CPX    LAST
02080 02AF 26 F6           BNE    MOVEFR
02090 02B1 B6 0129         LDA A  LAST+1
02100 02B4 30 02E6         SUB A  COMPAR
02110 02B7 B7 0129         STA A  LAST+1
02120 02BA B6 0128         LDA A  LAST
02130 02BD 82 00           SBC A  #0
02140 02BF B7 0128         STA A  LAST
02150                *STRINGS SAME LENGTH
02160 02C2 FE 01EC SAME    LDX    SPOIN1
02170 02C5 FF 02E7         STX    TEMP
02180 02C8 BC 01EE         CPX    SPOIN2
02190 02CB 26 01           BNE    SMLOOP
02200 02CD 39              RTS
02210 02CE A6 00    SMLOOP LDA A  0,X
02220 02D0 FE 01BE         LDX    SAVEX
02230 02D3 A7 00           STA A  0,X
02240 02D5 08              INX
02250 02D6 FF 01BE         STX    SAVEX
02260 02D9 FE 02E7         LDX    TEMP
02270 02DC 08              INX
02280 02DD FF 02E7         STX    TEMP
02290 02E0 BC 01EE         CPX    SPOIN2
02300 02E3 26 E9           BNE    SMLOOP
02310 02E5 39              RTS
02320 02E6 0001     COMPAR RMB    1
02330 02E7 0002     TEMP   RMB    2
02340 02E9 0004     LINENO RMB    4
02350 02ED 0002     SAVESX RMB    2
02360                *RESEQUENCE LINES STARTING WITH 0010
02370 02EF BD 015C SEQUEN JSR    CRLF
02380                *SET LINE NUMBER TO 0000
02390 02F2 86 30           LDA A  #'0
02400 02F4 B7 02E9         STA A  LINENO
02410 02F7 B7 02EA         STA A  LINENO+1
02420 02FA B7 02EB         STA A  LINENO+2
02430 02FD B7 02EC         STA A  LINENO+3
02440 0300 CE 0498         LDX    #TEXT
02450                *PROCESS EACH LINE OF SOURCE
02460                *LOOK FOR NEXT STX
02470 0303 A6 00    SQLOOP LDA A  0,X
02480 0305 81 02           CMP A  #$02
02490 0307 27 09           BEQ    GOTSTX
02500 0309 08              INX
02510 030A BC 0128         CPX    LAST
02520 030D 26 F4           BNE    SQLOOP
02530 030F 7E 047B GODONE  JMP    DONE
```

may even be what is often called "the null string"—that is, it need not exist. In this case, the first string is simply deleted wherever it occurs.

For example, typing R .THEN .GO TO. simply replaces all occurrences of THEN with the words GO TO. If the old and new strings are the same length, then the replacement, even for long programs, is almost instantaneous; if they are different lengths, then it takes a bit longer. For example, the command R .THEN.. removes all THENs and closes up the empty spaces. If there are many occurrences of THEN, then it may take a few seconds for the job to be complete.

The Replace command is very useful for changing messy BASIC programs into neat ones; I have used it often to straighten up programs for publication. For instance, the BASIC statement

```
1000 IFA=2GOTO30
```

is perfectly acceptable, but difficult to read. It can be changed to

```
1000 IF A = 2 GO TO 30
```

for better appearance.

In a program that has many such statements, it is a simple matter to fix them all with the R command. For example, the following sequence of commands unpacks the GOTO and inserts spaces before and after each.

```
R .GOTO. GO TO .
R . GO TO. GO TO.
R .GO TO .GO TO.
```

The first command inserts extra spaces as shown. Just in case some GOTOs already had spaces before or after them and now have two spaces, the last two commands replace any occurrence of GO TO with two spaces either before or after it with just one space. A similar set of commands provides spaces around the IF and equal signs.

Another use for the R command is to change variable names. For example, if the variable N9 is to be replaced by N, use the command F .N9.N.

The F command is extremely powerful, but it does require a bit of care. For example, the total length of the old plus the new string must be 40 characters or less. If a very long string is to be replaced by another long string, it may sometimes be necessary to first replace the old string with a dummy string such as (), and then replace the string () with the new string. Of course, the F command should first be used to check that the string ( ) did not exist in the original program, or else the result may not be exactly what you wanted!

5. *S.* The most powerful (and most difficult) command to implement is the S, or Sequence, command. The S command resequences all line numbers of the program to start with the number 0010 and increment in steps of 10.

The Sequence command not only changes the line number of each line, but it also corrects all references to line numbers in the program itself. All IF, GO TO, GOSUB and ON . . . GO TO statements are updated to refer to the new line numbers. Thus, the modified program will run after resequencing. (The S command is pretty smart, but there are two things it will not catch. A reference to a line number in a REMark statement may not be updated correctly, and a line reference inside a PRINT—as in PRINT "NOW EXECUTING LINE 100"—will also not be changed.)

The most common use for the S command is to renumber a program that has been extensively modified to open up the line numbers for further modification. It can also be used by "neatniks" (like me) who want people to think their programs were written right the first time and did not need any additions or deletions! The Sequence command was the main reason for my writing BASEDIT; all other functions are simply by-products. Sequence uses F for finding references in the program to line numbers being changed, and then uses R to change them.

Fig. 1 shows a simple example of using BASEDIT to edit a program. Assuming that a BASIC program has been read from a cassette, we start by printing it with the P command.

```
02540                    *GOT A STX
02550 0312 08    GOTSTX  INX
02560 0313 BC 0128       CPX   LAST
02570 0316 27 F7         BEQ   GODONE
02580 0318 A6 00         LDA A 0,X
02590                    *FOR CONTROL CHARACTERS, SKIP
02600 031A 81 30         CMP A #'0
02610 031C 2D F4         BLT   GOTSTX
02620                    *FOR LETTERS, GO TO NEXT LINE
02630 031E 81 39         CMP A #'9
02640 0320 2E E1         BGT   SQLOOP
02650                    *GOT FIRST DIGIT OF LINE NUMBER
02660                    *INCREMENT NEW LINE NUMBER
02670 0322 FF 02ED       STX   SAVESX
02680 0325 CE 02EC       LDX   #LINENO+3
02690 0328 09    SLOOP2  DEX
02700 0329 A6 00         LDA A 0,X
02710 032B 4C            INC A
02720 032C A7 00         STA A 0,X
02730 032E 81 3A         CMP A #$3A
02740 0330 26 06         BNE   LNOK
02750 0332 86 30         LDA A #'0
02760 0334 A7 00         STA A 0,X
02770 0336 20 F0         BRA   SLOOP2
02780                    *SUBSTITUTE NEW LINE NUMBER
02790 0338 CE 01C4 LNOK  LDX   #STRING
02800 033B FF 01EC       STX   SPOIN1
02810 033E CE 02E9       LDX   #LINENO
02820 0341 FF 0489       STX   SAVELX
02830 0344 7F 048B       CLR   ZFLAG
02840 0347 C6 04         LDA B #4
02850 0349 FE 02ED       LDX   SAVESX
02860 034C A6 00   SLOOP3 LDA A 0,X
02870 034E 7D 048B       TST   ZFLAG
02880 0351 26 07         BNE   SSTORE
02890 0353 81 30         CMP A #'0
02900 0355 27 0C         BEQ   SSUBST
02910 0357 7C 048B       INC   ZFLAG
02920 035A FE 01EC SSTORE LDX  SPOIN1
02930 035D A7 00         STA A 0,X
02940 035F 08            INX
02950 0360 FF 01EC       STX   SPOIN1
02960 0363 FE 0489 SSUBST LDX  SAVELX
02970 0366 A6 00         LDA A 0,X
02980 0368 08            INX
02990 0369 FF 0489       STX   SAVELX
03000 036C FE 02ED       LDX   SAVESX
03010 036F A7 00         STA A 0,X
03020 0371 08            INX
03030 0372 FF 02ED       STX   SAVESX
03040 0375 5A            DEC B
03050 0376 26 D4         BNE   SLOOP3
03060                    *SUBSTITUTED NEW LINE NUMBER FOR OLD
03070                    *NOW SEARCH FOR OLD LINE NUMBERS IN TEXT
03080 0378 CE 0498       LDX   #TEXT
03090 037B BD 017D SLOOP4 JSR  FINDST
03100 037E 5D            TST B
03110                    *GO ON TO NEXT LINE IF NO REFERENCES
03120 037F 26 06         BNE   GOTLN
03130 0381 FE 02ED       LDX   SAVESX
03140 0384 7E 0303       JMP   SQLOOP
03150                    *FOUND REFERENCE TO LINE;
03160                    *NEXT MUST NOT BE A DIGIT
03170 0387 FE 01C0 GOTLN LDX   TEMPSO
03180 038A A6 00         LDA A 0,X
03190 038C 81 30         CMP A #'0
03200 038E 2D 06         BLT   LNOK1
03210 0390 81 39         CMP A #'9
03220 0392 2E 02         BGT   LNOK1
03230 0394 20 E5         BRA   SLOOP4
03240                    *IS IT PRECEDED BY GOTO, GOSUB, OR THEN?
03250 0396 FE 01BE LNOK1 LDX   SAVEX
03260 0399 7F 048B       CLR   ZFLAG
03270 039C 09    LNOK2   DEX
03280 039D A6 00         LDA A 0,X
03290 039F 81 30         CMP A #'0
03300 03A1 27 F9         BEQ   LNOK2
03310 03A3 81 20         CMP A #$20
03320 03A5 27 F5         BEQ   LNOK2
03330                    *LOOK FOR COMMA IN ON...GOTO
03340 03A7 81 2C         CMP A #',
03350 03A9 26 05         BNE   NCOMMA
03360 03AB 7C 048B       INC   ZFLAG
03370 03AE 20 EC         BRA   LNOK2
03380                    *CHECK IF COMMA EXISTED BEFORE
03390 03B0 7D 048B NCOMMA TST  ZFLAG
03400 03B3 27 0E         BEQ   LASTLT
03410 03B5 81 05         CMP A #$05
03420 03B7 27 E3         BEQ   LNOK2
03430 03B9 81 30         CMP A #'0
03440 03BB 2D 06         BLT   LASTLT
03450 03BD 81 39         CMP A #'9
03460 03BF 2E 02         BGT   LASTLT
03470 03C1 20 D9         BRA   LNOK2
03480 03C3 FF 048C LASTLT STX  SAVERX
03490 03C6 81 4F         CMP A #'O
03500 03C8 27 14         BEQ   LGOTO
03510 03CA 81 42         CMP A #'B
03520 03CC 27 1E         BEQ   LGOSUB
03530 03CE 81 4E         CMP A #'N
03540 03D0 27 13         BEQ   LTHEN
03550                    *NO GOTO, THEN, OR GOSUB
03560                    *SO KEEP LOOKING
03570 03D2 FE 01BE FAIL  LDX   SAVEX
03580 03D5 08            INX
03590 03D6 BC 0128       CPX   LAST
03600 03D9 26 A0         BNE   SLOOP4
03610 03DB 7E 047B       JMP   DONE
03620                    *FOUND AN O, LOOK FOR GOT
03630 03DE C6 03   LGOTO  LDA B #3
03640 03E0 CE 0491       LDX   #GOTSTR+3
03650 03E3 20 0C         BRA   LOOKGO
03660                    *FOUND AN N, LOOK FOR THE
03670 03E5 C6 03   LTHEN  LDA B #3
03680 03E7 CE 0498       LDX   #THENST+3
03690 03EA 20 05         BRA   LOOKGO
03700                    *FOUND A B, LOOK FOR GOSU
03710 03EC C6 04   LGOSUB LDA B #4
03720 03EE CE 0495       LDX   #GOSUBS+4
03730 03F1 FF 0489 LOOKGO STX  SAVELX
03740 03F4 FE 048C       LDX   SAVERX
03750 03F7 09    SLOOP5  DEX
03760 03F8 FF 048C       STX   SAVERX
03770 03FB A6 00         LDA A 0,X
03780 03FD 81 20         CMP A #$20
03790 03FF 27 F6         BEQ   SLOOP5
03800 0401 FE 0489       LDX   SAVELX
03810 0404 09            DEX
03820 0405 FF 0489       STX   SAVELX
03830 0408 A1 00         CMP A 0,X
03840 040A 26 C6         BNE   FAIL
03850 040C FE 048C       LDX   SAVERX
03860 040F 5A            DEC B
03870 0410 26 E5         BNE   SLOOP5
03880                    *DEFINITELY FOUND GOTO, GOSUB, OR THEN
03890                    *PUT 05 AND NEW LINE NUMBER IN 'STRING'
03900 0412 FE 01EC       LDX   SPOIN1
03910 0415 86 05         LDA A #$05
03920 0417 A7 00         STA A 0,X
03930 0419 08            INX
03940 041A FF 01EE       STX   SPOIN2
03950                    *SKIP ZEROES AT START
03960 041D CE 02E9       LDX   #LINENO
03970 0420 A6 00   SLOOP6 LDA A 0,X
03980 0422 81 30         CMP A #'0
03990 0424 26 03         BNE   SLOOP7
04000 0426 08            INX
04010 0427 20 F7         BRA   SLOOP6
04020                    *GOT FIRST NONZERO DIGIT
04030 0429 FF 0489 SLOOP7 STX  SAVELX
04040 042C A6 00         LDA A 0,X
04050 042E FE 01EE       LDX   SPOIN2
04060 0431 A7 00         STA A 0,X
04070 0433 08            INX
04080 0434 FF 01EE       STX   SPOIN2
04090 0437 FE 0489       LDX   SAVELX
04100 043A 08            INX
04110 043B 8C 02ED       CPX   #LINENO+4
04120 043E 26 E9         BNE   SLOOP7
04130                    *BOTH LINE NUMBERS IN 'STRING'
04140                    *FIND DIFFERENCE IN LENGTHS
04150 0440 FE 01EE       LDX   SPOIN2
04160 0443 4F            CLR A
04170 0444 BD 0267       JSR   CALCDF
04180                    *GO TO DO SWITCH
04190 0447 BD 0279       JSR   SWITCH
04200                    *AFTER REPLACEMENT OF LINE NUMBERS,
04210                    *UPDATE CURRENT POINTER IF STRINGS
04220                    *WERE DIFFERENT LENGTHS AND REFERENCE
04230                    *WAS BEFORE CURRENT LINE
04240 044A F6 02E6       LDA B COMPAR
04250 044D 26 03         BNE   CHECK1
04260 044F 7E 03D2 GOFAIL JMP  FAIL
04270                    *DIFFERENT LENGTHS; BEFORE?
04280 0452 B6 02ED CHECK1 LDA A SAVESX
04290 0455 B1 01BE       CMP A SAVEX
04300 0458 27 04         BEQ   CHECK2
04310 045A 2A 0A         BPL   UPDATE
04320 045C 20 F1         BRA   GOFAIL
04330 045E B6 02EE CHECK2 LDA A SAVESX+1
04340 0461 B1 01BF       CMP A SAVEX+1
04350 0464 2B E9         BMI   GOFAIL
04360                    *YES, SO UPDATE
04370 0466 FE 02ED UPDATE LDX  SAVESX
04380 0469 5D            TST B
04390 046A 2A 09         BPL   SUBPTR
04400 046C 08      ADDPTR INX
04410 046D 5C            INC B
04420 046E 26 FC         BNE   ADDPTR
04430 0470 FF 02ED PTROK  STX  SAVESX
04440 0473 20 DA         BRA   GOFAIL
04450 0475 09      SUBPTR DEX
04460 0476 5A            DEC B
04470 0477 26 FC         BNE   SUBPTR
04480 0479 20 F5         BRA   PTROK
04490                    *WHEN DONE REMOVE ALL 05 CODES
04500 047B 86 05   DONE   LDA A #$05
04510 047D B7 01C4       STA A STRING
04520 0480 CE 01C5       LDX   #STRING+1
04530 0483 FF 01EC       STX   SPOIN1
04540 0486 7E 024B       JMP   REPL2
04550 0489 0002    SAVELX RMB   2
04560 048B 0001    ZFLAG  RMB   1
04570 048C 0002    SAVERX RMB   2
04580 048E 47      GOTSTR FCC   'GOT'
      048F 4F
      0490 54
04590 0491 47      GOSUBS FCC   'GOSU'
      0492 4F
      0493 53
      0494 55
04600 0495 54      THENST FCC   'THE'
      0496 48
      0497 45
04610 0498 0001    TEXT   RMB   1
04620 A048               ORG   $A048
04630 A048 0100          FDB   HARDST
04640                    END
```

Then the command R .GOTO. GO TO. inserts a space into all GOTOs. The command R .SPOT .STOP changes the spelling of STOP. The command R.,., . adds a space after every comma. A Find command finds all lines containing the word PRINT; the S command renumbers the lines; and finally, the P command prints out the result.

```
> P

0001 INPUT A
0002 ON A GOTO 10,100
0007 GO TO 1
0010 IF A=A↑2 THEN 2000
0100 GOSUB 5000
5000 PRINT "SPOT"
5001 END


> R .GOTO.GO TO.
> R .SPOT.STOP.
> R .,.,.
> F .PRINT.
5000 PRINT "STOP"
> S

> P

0010 INPUT A
0020 ON A GO TO 40, 50
0030 GO TO 10
0040 IF A=A↑2 THEN 2000
0050 GOSUB 60
0060 PRINT "STOP"
0070 END
```

Fig. 1. Sample printout produced by BASEDIT.

The BASLIST Program

BASLIST is not nearly as useful as BASEDIT, but it, too, is handy to have. BASLIST accepts as input a BASIC source program cassette, splits it up into 11-inch pages of 66 lines and numbers each page. It is also a machine-language program occupying locations 0100 through 01A1 in memory; the remaining memory from 01A2 and up is used for storing the BASIC program to be printed. Its hard-start address is 0100, and the restart address is 0103.

When BASLIST is started at 0100, it immediately goes into its read mode. A program can then be read in from cassette tape and stored into memory by BASLIST. When the cassette is done, the paper in the printer should be positioned about four lines from the bottom of a page—assuming that perforated paper is used. (BASLIST assumes that the printer is a teleprinter or other serial printer; it is not designed to work with the SWTP printer.)

Once the paper is properly positioned, start the printout by typing a Ctrl-E (hex 05) code on the keyboard. The program then does eight line feeds and starts printing. When printing is over, BASLIST goes into a loop and halts. It can be interrupted by pressing the reset button; the printout can be restarted from the beginning at any time by starting at 0103.

Many BASIC tapes from the SWTP 8K BASIC system are preceded by the word SAVE and followed by an extra READY. BASLIST removes these from the printout and provides a neat listing of only the program itself. (This is handy for preparing BASIC programs for submission to *Kilobaud*.)

Each page of the printed output is preceded by the words PAGE NO. and a page number starting at 1. The text for this line is stored at locations 0124 through 0136 of the program (see line 00270 of the BASLIST source listing). But the words PAGE NO. are preceded by ten spaces in locations 0124 through 012D. Or, if desired, these ten spaces could be replaced by the ASCII codes for up to nine characters of a program name prior to running (using the M command of the monitor); the program name will then also print on every page. ■

```
00010                          NAM    BASLIST
00020                  *PROGRAM TO PAGINATE BASIC LISTINGS
00030                          OPT    O
00040                  *MONITOR ENTRY POINTS
00050        E1AC      INEEE  EQU    $E1AC
00060        E1D1      OUTEEE EQU    $E1D1
00070        E07E      PDATA  EQU    $E07E
00080        E0BF      OUTBYT EQU    $E0BF
00090 0100                     ORG    $0100
00100                  *HARD AND SOFT STARTS
00110 0100 7E 0106 HARDST JMP     START
00120 0103 7E 013E SOFTST JMP     LIST
00130 0106 CE 0103 START  LDX     #$0103
00140 0109 FF A048        STX     $A048
00150 010C 8E A042        LDS     #$A042
00160 010F CE 01A2        LDX     #TEXT
00170 0112 BD E1AC LOOP   JSR     INEEE
00180 0115 A7 00          STA A   0,X
00190 0117 81 05          CMP A   #$05
00200                  *EXIT ON CONTROL E
00210 0119 27 23          BEQ     LIST
00220 011B 08             INX
00230 011C FF 0121        STX     LAST
00240 011F 20 F1          BRA     LOOP
00250 0121 0002    LAST   RMB     2
00260 0123 0001    PAGENO RMB     1
00270 0124 20      PAGE   FCC                    PAGE NO.
      0125 20
      0126 20
      0127 20
      0128 20
      0129 20
      012A 20
      012B 20
      012C 20
      012D 20
      012E 50
      012F 41
      0130 47
      0131 45
      0132 20
      0133 4E
      0134 4F
      0135 2E
      0136 20
00280 0137 04              FCB     $04
00290 0138 0D      CRLFLF FCB     $D,$A,$A,$4
      0139 0A
      013A 0A
      013B 04
00300 013C 0002    XTEMP  RMB     2
00310 013E CE 01A2 LIST   LDX     #TEXT
00320 0141 8E A042        LDS     #$A042
00330                  *SKIP TO FIRST STX 02
00340 0144 A6 00   LOOK   LDA A   0,X
00350 0146 81 02          CMP A   #$02
00360 0148 27 03          BEQ     GO
00370 014A 08             INX
00380 014B 20 F7          BRA     LOOK
00390                  *READY TO PRINT
00400 014D 7F 0123 GO     CLR     PAGENO
00410 0150 86 0D          LDA A   #$0D
00420 0152 BD E1D1        JSR     OUTEEE
00430                  *SKIP 8 LINES
00440 0155 C6 08   NEWPAG LDA B   #8
00450 0157 86 0A   SKIP8  LDA A   #$0A
00460 0159 BD E1D1        JSR     OUTEEE
00470 015C 5A             DEC B
00480 015D 26 F8          BNE     SKIP8
00490                  *PRINT NAME AND PAGE
00500 015F FF 013C        STX     XTEMP
00510 0162 CE 0124        LDX     #PAGE
00520 0165 BD E07E        JSR     PDATA
00530                  *INCREMENT AND PRINT PAGE NO
00540 0168 B6 0123        LDA A   PAGENO
00550 016B 8B 01          ADD A   #$01
00560 016D 19             DAA
00570 016E B7 0123        STA A   PAGENO
00580 0171 CE 0123        LDX     #PAGENO
00590 0174 BD E0BF        JSR     OUTBYT
00600                  *PRINT CR AND 2 LF
00610 0177 CE 0138        LDX     #CRLFLF
00620 017A BD E07E        JSR     PDATA
00630 017D FE 013C        LDX     XTEMP
00640 0180 C6 38          LDA B   #56
00650                  *DO NEW LINE
00660 0182 A6 00   NEWLIN LDA A   0,X
00670 0184 81 0A          CMP A   #$0A
00680 0186 27 0F          BEQ     ENDLIN
00690 0188 81 03          CMP A   #$03
00700 018A 27 14          BEQ     STOP
00710 018C BD E1D1        JSR     OUTEEE
00720 018F 08             INX
00730 0190 BC 0121        CPX     LAST
00740 0193 27 0B          BEQ     STOP
00750 0195 20 E8          BRA     NEWLIN
00760 0197 BD E1D1 ENDLIN JSR     OUTEEE
00770 019A 08             INX
00780 019B 5A             DEC B
00790 019C 27 B7          BEQ     NEWPAG
00800 019E 20 E2          BRA     NEWLIN
00810 01A0 20 FE   STOP   BRA     STOP
00820 01A2 0001    TEXT   RMB     1
00830 A048                ORG     $A048
00840 A048 0100    PC     FDB     HARDST
00850                     END
```

Program 2. BASLIST program.

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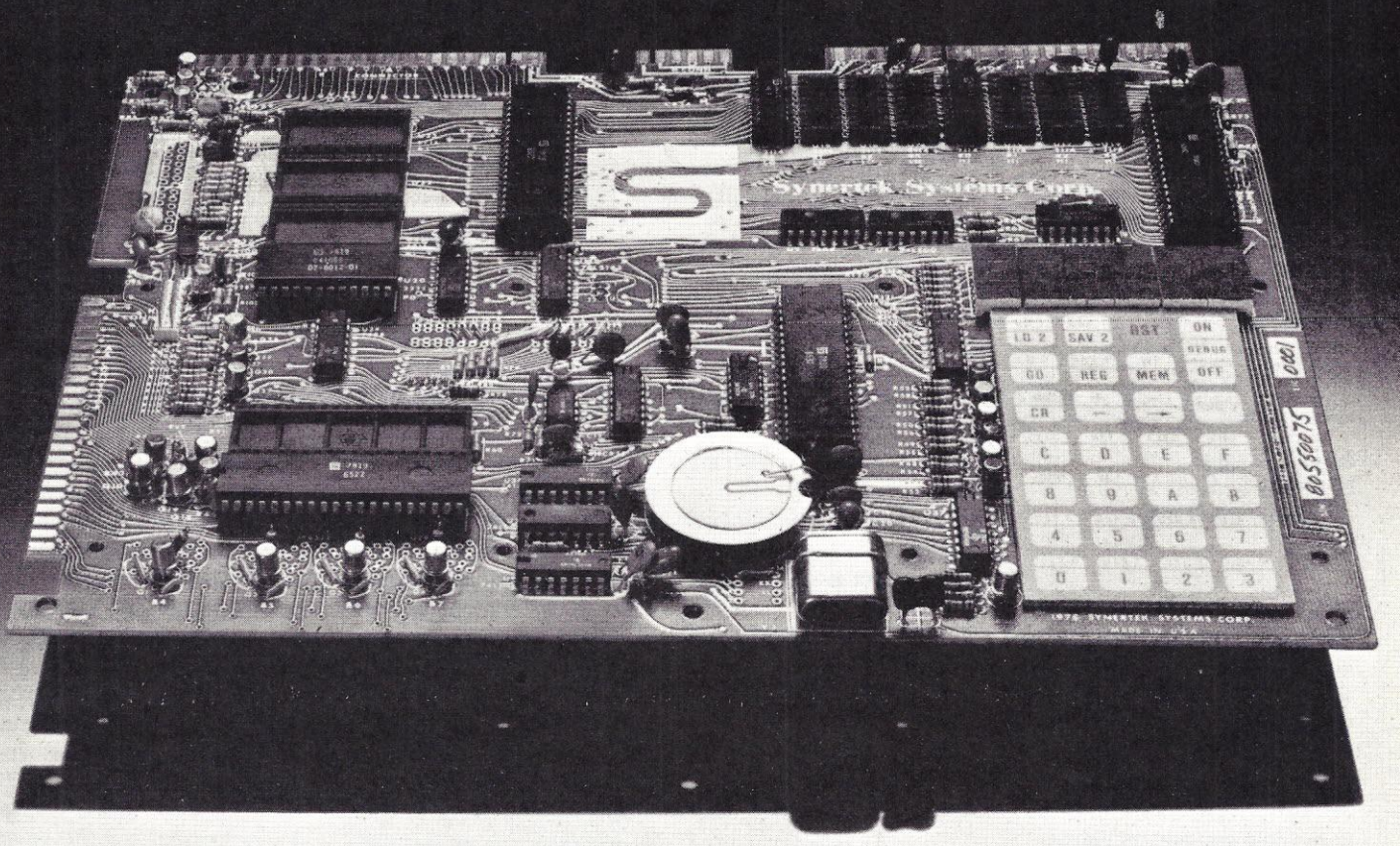

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Pittsburgh PA 15211

Can you see the reaction of every register in your microprocessor as you are single-stepping through the program? If so, skip this article; if not, read on.

On my KIM-1 microprocessor, all the registers are internal to the chip and are not directly visible. This is a problem common to most other chips and systems as well. There is a means for "looking at" all registers in single-step mode, but after many hours of doing this, I decided to let "constructive laziness" take over and to make a front panel showing all registers. This display I call the *u-Panel.*

My criteria for the panel are as follows.

1. No object program modification.
2. Cost (as inexpensive as possible).
3. No physical modifications to KIM.
4. Simple to load.
5. Easy to connect.
6. Looks like a front panel.

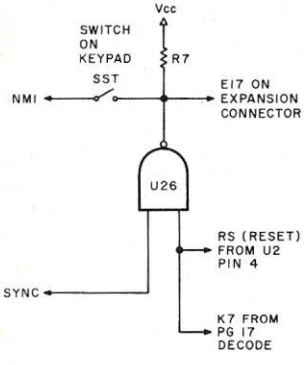


Fig. 1. Within the KIM, a signal is generated at the output of U26 with each instruction execution, and is made available at pin 17 of the expansion connector.

KIM Single-Step Operation

In the KIM monitor SST (single-step) mode, the monitor is displaying the current address and the current contents (data or instruction). When the GO button is pressed, the monitor is exited, the instruction is executed and, at the same time as execution, the NMI (nonmaskable interrupt) line is pulled low thus enabling the interrupt. The interrupt is not executed, however, until the instruction currently in the processor is finished.

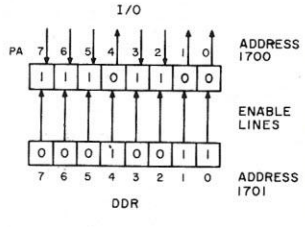


Fig. 2. The data direction register and I/O register shown being set up for saving all the KIM registers.

When the instruction "execute" cycle is done, the KIM looks at the NMI vector stored at 17FA-17FB (hex), the contents of which are normally 1C00 (hex), and loads these contents into the program counter. The interrupt is now serviced. During all this action, the program counter and stack pointer are pushed onto the stack.

When the interrupt program is executed, the stored registers are first pulled from the stack and stored in zero page locations, along with the accumulator and the X and Y index registers. These locations are the ones "looked at" during KIM SST operations. The monitor program, which was entered through the interrupt, then takes over the job of displaying the data and address, scanning the keys, etc. When the GO key is pressed again, an RTI (return from interrupt) is executed, and exit from monitor occurs; the whole process begins again.

Looking at the schematic shown in Fig. 1, I saw that a signal is generated on the output of U26 every time an instruction is executed. This signal combines the SYNC signal and an enable from the ROM chip and is fed into an N-O (normally open) switch (the SST). It also runs to E17 on the expansion edge connector. That signal is then used to trigger (with the SST switch closed) the NMI response previously described.

I decided to use the IRQ (interrupt request), which has a vector at 17FE-17FF (hex), and an external N-O switch was connected between E4 (IRQ input) and E17 (output of U26) on the expansion connector. With the switch open, the program runs normally without interruption. With the switch closed, and upon an "execute" by the microprocessor (the GO button being pressed), the IRQ vector is loaded. Therefore, I can place my SST routine starting address into the IRQ vector and will execute the routine every time an IRQ is generated.

The program to enable the SST and output the registers resides on page 1 (0100-01FF hex). There are two reasons for this:

1. The stack sits on page 1, and I prefer that if anything is going to get overwritten due to stack overflow it be the short SST and not the long object program.

2. Page 0 is used for data. That's why there is zero page addressing.

There are two pages left—page 2 (0200-02FF hex) and page 3 (0300-03FF hex). If the user's program is to use continuous memory, the only place left for user program is starting on page 2.

Now, since I want to dump all of the registers to an external device before returning back to

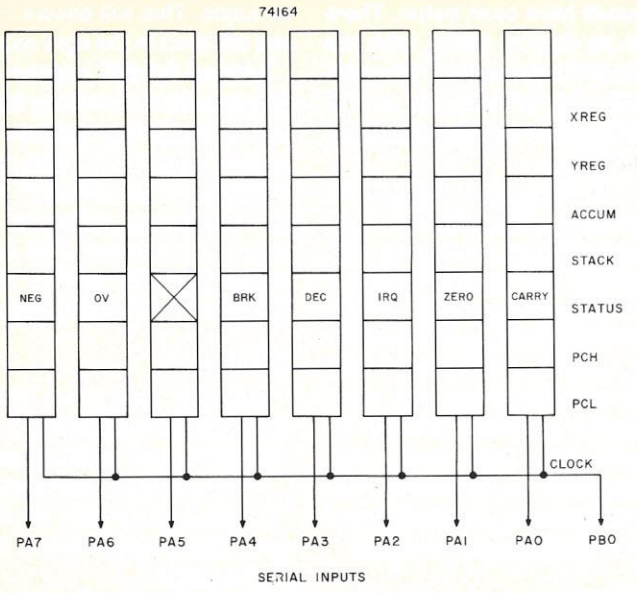


Fig. 3. KIM registers.

the monitor, I can't use the NMI interrupt. This is one of the reasons I selected the IRQ interrupt. Also, now that the IRQ is being used, the routine in ROM that saves all the registers and inserts them in zero page locations is missing. Therefore, this must be the first part of the new SST routine.

The I/O (input-output) ports on the KIM must be preselected by first setting the appropriate DDR (data direction register) bits. The DDR's bits are in direct correspondence to the I/O register bits. That is, if you wanted the least significant bit of the I/O port to be an input and the rest of the seven bits to be outputs, the word 01 (hex) 0000 0001 (binary) would be inserted into the DDR. If I wanted an 8-bit output, the DDR would be set to FF (hex) 1111 1111 (binary). In Fig. 2 the DDR has been loaded with 13 (hex) 0001 0011 (binary). Note how the I/O register is set.

Looking now at Fig. 3, you will see that the registers to be output are as follows:

1. Accumulator
2. X index register
3. Y index register
4. Status register
5. Stack pointer
6. PC high (most significant bits of the program counter)
7. PC low (least significant bits of the program counter)

These registers are found in the storage locations down on page 0. They are consecutively loaded from 00EF-00F5 (hex) in this sequence:

00EF PC lo
00F0 PC hi
00F1 Status
00F2 Stack
00F3 Accumulator
00F4 Y index
00F5 X index

The Hardware

The front of the *u-Panel* is shown in the accompanying photo. The accumulator is at the top, followed by the X and Y registers. The program counter is the long one in the middle, with the status register at the lower left and the stack pointer at lower right.

As you can now see from Fig. 3, I am loading eight bits of information (the register) seven levels deep. Each shift register is a 74164, and the serial inputs of each are connected to a specific corresponding bit of the I/O port, PA7-PA0. The clock inputs of the 74164s are connected in parallel, and a pulsed signal is applied from a pin of the other I/O port (PB0).

With seven synchronizing pulses from PB0, the shift registers will shift any data applied to the serial inputs down the line, thus loading all the information sequentially applied from the I/O ports into the seven-level-deep output pins of the shift register. These output pins are then connected to 7406 inverting drivers to provide the necessary current to light the front panel LEDs. See Fig. 4.

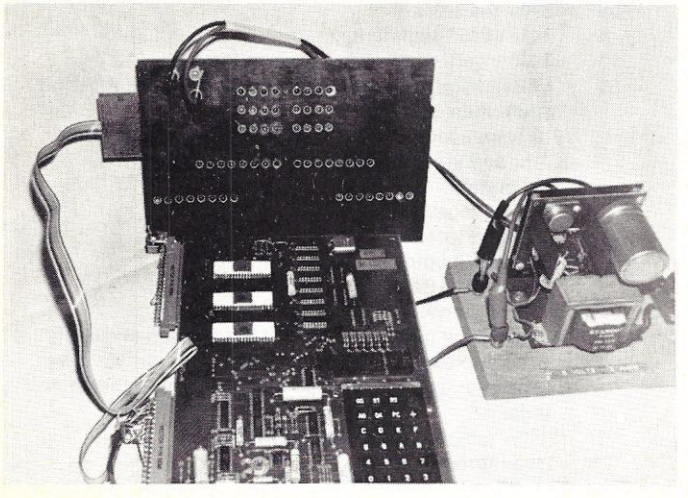
The Software

Turning now to the SST program listing, you can see the first part is the packing segment to place all register information into zero page memory locations 00FE-00F5 (hex). The next three parts are for setting the DDRs of the two I/O ports and for pulling PB0 low. The next part is to take the information (data) sequentially from the zero page locations, place the data on the I/O pins and pull PB0 high to shift the shift registers up one place.

Next comes a check to see if all locations have been loaded. If not, go back, increment to the next location, output to the 74164s, toggle PB0 and repeat until all seven levels are full. When all of the levels have been filled, exit from the SST program and enter the KIM ROM monitor at location 1C4F (hex), which is called BEGIN.

With all shift registers filled with KIM register data, and the KIM monitor in a loop awaiting another GO command, you can now observe all of the registers on the front of the *u-Panel*. This information will stay until pushed out by your pressing the GO button and executing another instruction.

The front layout of the *u-Panel* is shown in the photo. It can be modified to suit. I have placed an edge connector and three female banana jacks to interface with the KIM merely because I had them around. A single larger edge connector



Completed front panel connected to, and working with, KIM.

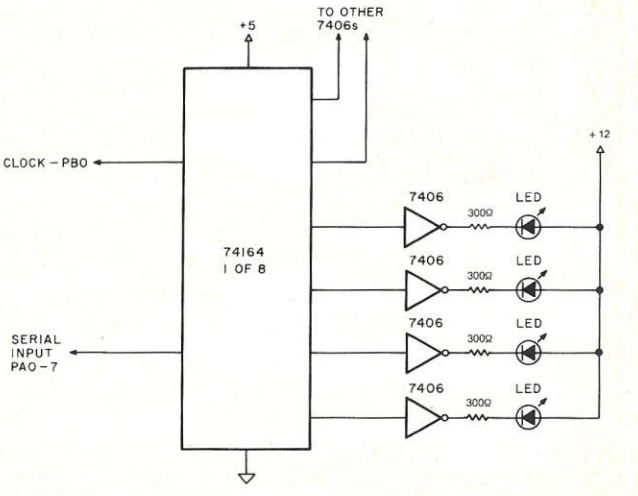
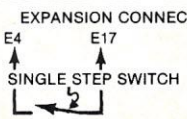


Fig. 4. Front panel LED interface circuit.

```
0130   STA   85
0131   F3
 32    PLA   68
 33    STA   85
 34    F1
 35    PLA   68
 36    STA   85
 37    EF                 Loads 00EF-00F5
 38    STA   85           on IRQ escape.
 39    FA
 3A    PLA   68
 3B    STA   85
 3C    F0
 3D    STA   85
 3E    FB
 3F    STY   84
 40    F4
 41    STX   86
 42    F5
 43    TSX   BA
 44    STX   86
 45    F2
-------------------------------------------------
 46    LDA   A9
 47    #01                Sets PB0 to output
 48    STA   8D
 49    03
 4A    17
-------------------------------------------------
 4B    LDA   A9
 4C    #00
 4D    STA   8D           Stores 0 in PB0
 4E    02
 4F    17
-------------------------------------------------
 50    LDA   A9
 51    #FF                Sets PA0-PA7 as output
 52    STA   8D
 53    01
 54    17
-------------------------------------------------
 55    LDX   A2           # of locations to output
 56    #07
 57    LDA   B5           Start at F5
 58    EE
 59    STA   8D           Output F5
 5A    00
 5B    17
015C   LDA   A9           Set PB0 high
 5D    #01
 5E    STA   8D           Load PA0-PA7 into shift register
 5F    02
 60    17
-------------------------------------------------
 61    NOP   EA
 62    NOP   EA           Settling time
 63    NOP   EA
-------------------------------------------------
 64    LDA   A9
 65    #00
 66    STA   8D           Set PB0 low
 67    02
 68    17
-------------------------------------------------
 69    NOP   EA
 6A    NOP   EA           Settling time
 6B    NOP   EA
-------------------------------------------------
 6C    DEX   CA           Set X to (last reg.) - 1
 6D    BNE   D0           If X not 0, go back and
 6E    E8                 output register.
 6F    JMP   4C           If X zero, jump to 'START'
 70    4F                 in KIM ROM listings.
 71    1C
-------------------------------------------------
NMI = 17FA - 17FB = 1C00
RST = 17FC - 17FD = 1C00  VECTORS
IRQ = 17FE - 17FF = 0130
-------------------------------------------------
Note: All programs must have CLI (clear interrupt)
in program initialization.
-------------------------------------------------
```



Program listing.

would have been better. There is no critical wiring with the possible exception of the current requirements for the 56 LEDs. You must use adequate-sized wire.

The ICs were cemented directly to the phenolic board, and wire-wrap sockets were inserted. I like wire wrap because there is no possibility of heat burnout of chips, and (for me) it is faster than soldering. If you do not want to use wire wrap, careful soldering will do as well. The LEDs were also cemented to the board. The whole building and testing procedure took about six hours.

Operation

Once the whole thing is built and tested, load the SST program starting at 0130 (hex) and put the user program anywhere there is spare memory. Again 0200 (hex) is recommended. The actual location is not important as far as the SST routines are concerned. To test a program under SST, place the added SST switch ON (closed), set the IRQ vector 17FE-17FF (hex) to 0130 (hex) instead of 1C00 (hex) and load your program.

Whenever the GO key on the KIM is pressed, all registers will be seen on the *u-Panel*, and the next instruction and address will be seen on the KIM LED displays. Leave the KIM SST switch OFF as it will not be needed. One last item—at the beginning of your program, place a CLI (clear interrupt) instruction. This will ensure that you will start in the right mode.

I placed the SST program on cassette tape to facilitate loading and reduce loading time. By loading the SST on tape and "plugging in" the *u-Panel*, I can be debugging programs in about two minutes. This is a reasonable time savings over hand-loading the SST program.

Summary

Now look back to my objectives stated at the beginning of this article. Did I achieve them?

1. No program modification . . . I think 99 percent on this one. The only addition is the CLI instruction.

2. Cost . . . with a little scrounging, you can duplicate this unit for $25 or less. (A complete parts list is shown in Table 1.)

3. No physical modifications . . . 100 percent on this one.

4. Simple to load . . . with only 64 program steps and the availability of cassette, it is simple.

5. Ease of connection . . . one edge connector and two power supply connections (both of which are on the KIM anyway).

6. Looks like a front panel . . . I think it does!

I have built the *u-Panel* to be used by students in a classroom-laboratory situation for instructional purposes. I feel that you, as well as my students and I, will benefit by seeing all registers at once. I hope you get as much out of *u-Panel* as I have. ■

56	300Ω resistors
8	74164 Shift registers
10	7406 Inverting drivers—open collector
56	LEDs. If you wish to have different colors for the registers then order: 8 each accumulator, X and Y registers, stack pointer and status register. (different colors) Total 40 16 for program counter Grand total 56
18	Sockets, 14-pin DIP
1	Phenolic or Bakelite board for front panel
1	15-pin connector to interface with KIM
2	44-pin edge connectors for KIM expansion and application connectors. Do this only if you want to have separate connectors for the *u-Panel*, otherwise order 1.
1	SPST (single pole-single throw) switch
	Hookup wire
	Glue

Table 1. Parts list.

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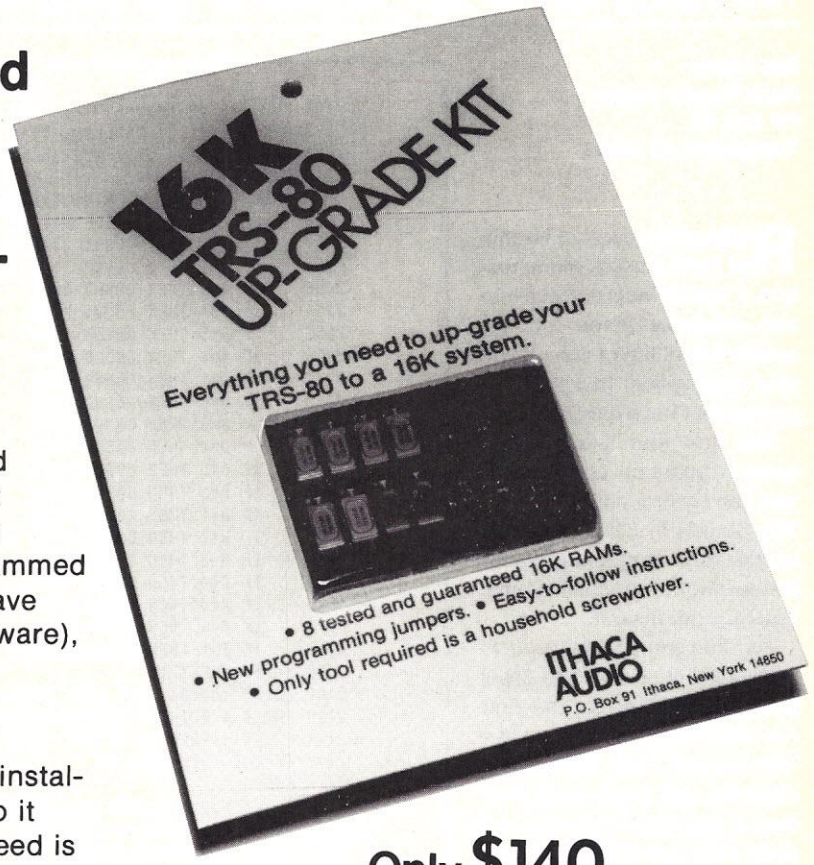

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✓ Reader Service—see page 147

Rolling Dice

This rolling routine can be used in any game in which you caress the old cubes.

Rod Hallen
Road Runner Ranch
PO Box 73
Tombstone AZ 85638

Rolling Dice was not intended to be a stand-alone routine. It can be incorporated into any computer game that requires the rolling of dice. It will give some visual feel to many games that have only listings.

The first four lines of Program A enhance and identify and can be dropped if desired. The CLEAR in 2040 keeps my stacks from expanding out of bounds from too many reruns. You may not need it.

The first run through the "I" FOR-NEXT loop (2040 to 2090) generates and draws the first die, and X will equal its value. The second loop builds the other die, and X will equal both dice. X can now be used in the game that you attached "Rolling Dice" to.

2110 to 2112 are part of my file routine, and here you can jump or GOSUB to the program that uses these dice. I used (1*1*1*1*1+9) in 2121 to 2126 instead of (1†5 + 9) because I have never been able to get my BASIC to square, cube, etc., a number. This program is written in Processor Technology's BASIC 5 and should fit just about any version of BASIC.

If your BASIC interpreter allows the "ON . . . GOSUB . . ." statement, lines 2051 to 2076 can be replaced with Program B. This will save you 15 statements. Good luck with the dice!■

```
2000 FOR Z=1 TO 10: PRINT : NEXT Z
2010 PRINT TAB(22),"ROLLING DICE ROUTINE"
2020 PRINT TAB(14),"BY ROD HALLEN  TOMBSTONE, AZ 7 JAN 78"
2030 PRINT TAB(7),"* - - - - - - - - - - - - - - - - - - - - - - - - *"
2040 CLEAR : PRINT : PRINT TAB(10),"HHHHHHHHHHHHHH"
2050    FOR I=1 TO 2: FOR K=1 TO 4: D=INT(6*RND(0)+1): NEXT K
2051    IF D=1 THEN GOSUB 2122
2052    IF D=2 THEN GOSUB 2123
2053    IF D=3 THEN GOSUB 2123
2054    IF D=4 THEN GOSUB 2124
2055    IF D=5 THEN GOSUB 2124
2056    IF D=6 THEN GOSUB 2124
2061    IF D=1 THEN GOSUB 2125
2062    IF D=2 THEN GOSUB 2122
2063    IF D=3 THEN GOSUB 2125
2064    IF D=4 THEN GOSUB 2122
2065    IF D=5 THEN GOSUB 2125
2066    IF D=6 THEN GOSUB 2124
2071    IF D=1 THEN GOSUB 2122
2072    IF D=2 THEN GOSUB 2126
2073    IF D=3 THEN GOSUB 2126
2074    IF D=4 THEN GOSUB 2124
2075    IF D=5 THEN GOSUB 2124
2076    IF D=6 THEN GOSUB 2124
2080    IF I=1 THEN GOSUB 2121
2090 X=X+D: NEXT I
2100 PRINT TAB(9),"THE DICE TOTAL";X,TAB(41),"HHHHHHHHHHHHHH"
2110 PRINT : PRINT : INPUT "TYPE 1 FOR DICE, 2 FOR INDEX, AND 3 FOR BASIC. ?",W
2111 PRINT : PRINT : IF W=1 THEN GOTO 2030
2112 IF W=2 THEN GOTO 30
2113 END
2121 PRINT TAB(I*I*I*I*I+9),"HHHHHHHHHHHHHH";TAB(41),"HHHHHHHHHHHHHH": RETURN
2122 PRINT TAB(I*I*I*I*I+9),"HH          HH": RETURN
2123 PRINT TAB(I*I*I*I*I+9),"HH  ()      HH": RETURN
2124 PRINT TAB(I*I*I*I*I+9),"HH  ()  ()  HH": RETURN
2125 PRINT TAB(I*I*I*I*I+9),"HH    ()    HH": RETURN
2126 PRINT TAB(I*I*I*I*I+9),"HH      ()  HH": RETURN
2127 END
```

Program A. The Rolling Dice routine in BASIC can be incorporated into any game that requires the roll of the dice.

```
2051 ON D GOSUB 2122,2123,2123,2124,2124,2124

2061 ON D GOSUB 2125,2122,2125,2122,2125,2124

2071 ON D GOSUB 2122,2126,2126,2124,2124,2124
```

Program B. If your BASIC allows the above statement, these three lines can be substituted for lines 2051 to 2076 in Program A for a savings of 15 lines.

```
                ROLLING DICE ROUTINE
          BY ROD HALLEN  TOMBSTONE, AZ 7 JAN 78
     * - - - - - - - - - - - - - - - - - - - - - - - - *

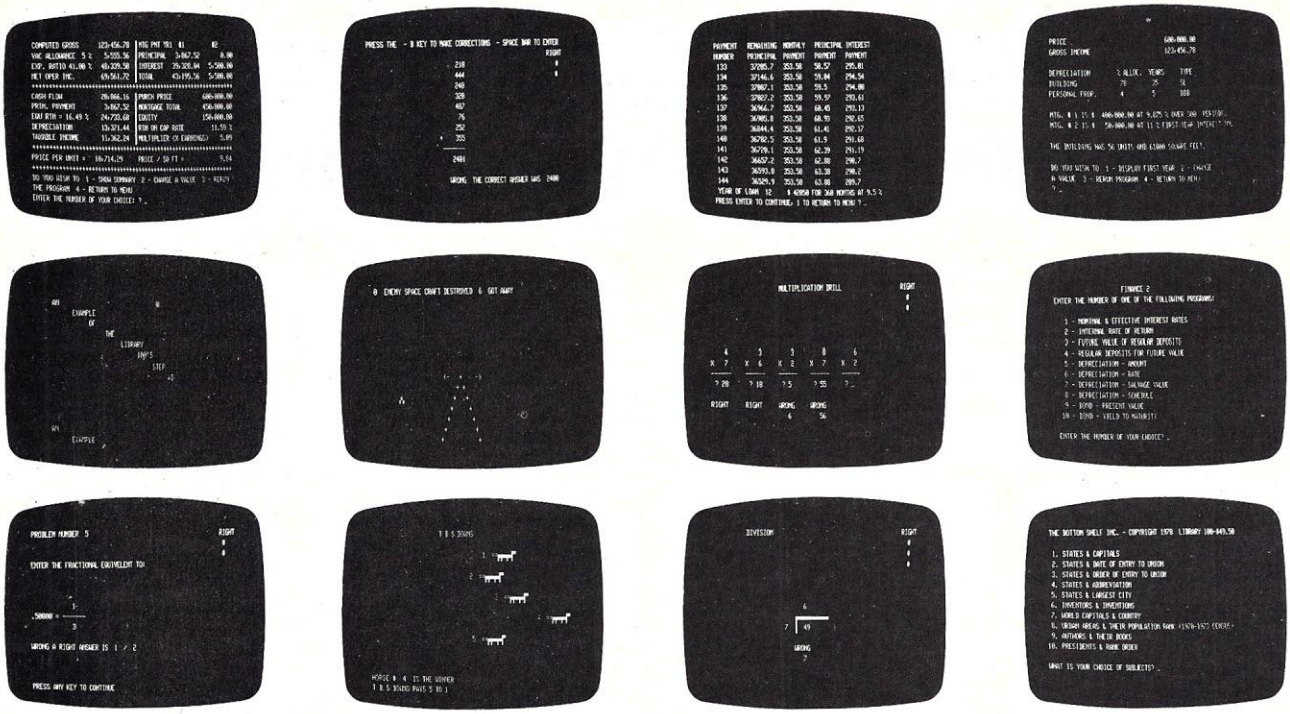
        HHHHHHHHHHHHHH
        HH          HH
        HH    ()    HH
        HH          HH
        HHHHHHHHHHHHHH                HHHHHHHHHHHHHH
                                      HH  ()  ()  HH
                                      HH          HH
                                      HH  ()  ()  HH
      THE DICE TOTAL 5                HHHHHHHHHHHHHH

  TYPE 1 FOR DICE, 2 FOR INDEX, AND 3 FOR BASIC. ?
```

Fig. 1. The printed lines at the beginning and end are part of my file index system and can be left out.

Level II TRS-80 + The LIBRARY 100

You shouldn't have one without the other!!



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Pseudo Graphics: An Inexpensive Approach

If the price of full-blown graphics has you down, then arise for long enough to check out this no-cost method. And while you're at it, chalk up your cue stick.

Margarine, Dacron, wigs—your life is probably full of substitutes for the real thing. So, why not for your computer system, too? Here comes pseudo-graphics.

Now *pseudo* doesn't mean *half-baked.* Both pseudo and full-baked graphics work on the same basic principle. Conceptually, the screen of a CRT (TV-type terminal) is divided into several small rectangles. Video effects are accomplished by turning various combinations of them on and off. Many interesting possibilities, both practical and recreational, can be achieved.

Any computer graphics requires a blend of hardware and software in order to operate. To add graphics to a computer system, a new hardware board is normally required. Also, additional software is usually necessary to drive it. Ideally, any graphics has high resolution, fast hardware and software execution times, color, versatility and low price.

Something for Nothing?

Now, get ready. We are introducing graphics for your system with low resolution, slow execution (but fast enough for certain video effects), black and white and little flexibility.

Hold it! Before you deluge the *Kilobaud* editors with threatening mail, consider this. The cost to implement this is cheap—dirt cheap. If you have BASIC software and a CRT device with a few simple cursor control functions, you've already got all you need. Your system is capable of pseudo-graphics right now.

Even if you presently have a graphics capability, the game introduced in this article may prove interesting. It is a video game different than the usual computer fare. At least it may give you ideas for new ways to use your graphics.

Now, let's look at the basic idea of pseudo-graphics.

What It's All About

Consider your CRT screen completely divided into rectangular cells. Each of these cells is the size of one alphanumeric character on your screen. The cells are in a two-dimensional field filling the screen. The width of this field is the number of characters you can get in one line of display. The height of the field is the number of lines you can have on the screen at one time.

Now suppose your cursor appears in one of these cells. By issuing successive commands to move the cursor one rectangle orthogonally, we can generate a moving-ball effect similar to that achieved on video tennis and hockey games.

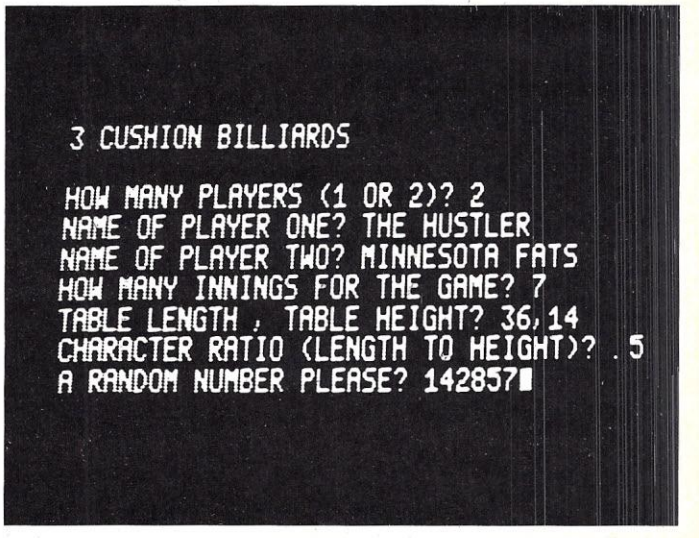
When this idea is packaged with the appropriate essentials and wrapped with some accompanying frills, bingo!—a new dimension to your computer system is realized. In order to utilize pseudo-graphics, your system must have a few simple capabilities. Let's look at them now.

The Bare Bones

First, a CRT-type output device is obviously necessary. Sorry, but if you have only a hard-copy terminal, we can't help you, Sundance (to paraphrase a famous actor). Go directly to the next article.

A controllable cursor is a necessity. Typical cursor characters are a block rectangle (sometimes blinking) or an underscore character. Almost anything will do. If your keyboard has cursor control keys for cursor right, left, up and down, you have 90 percent capability. If not, take heart. Many terminals without these keys still have the basic internal hardware capability to accomplish these functions. See the section later on tuning the program. If your system has no cursor character (or an inadequate one), this problem can be overcome as explained later in the section on troubleshooting.

The Hustler (there's that famous actor again) vs Minnesota Fats (The Great One).



1. The Hustler challenges Minnesota Fats to a seven-inning game of three-cushion billiards. A large table size is set, presenting a challenging game to these championship-caliber rivals.

Either a home-down or home-up (preferably both) capability is needed. Also, the ability to erase the screen is nice, but can be achieved artificially.

Your BASIC software must have certain capabilities. The program presented here was written in Altair BASIC and its function names will be used as standard. The prime requirement is an OUT statement, or its equivalent, used to send a command to the CRT to print a certain character. This character may be alphanumeric or a cursor control command. The ASCII value of the desired character is contained in a variable that appears as part of the OUT statement.

Before each OUT statement, a WAIT statement is used to ensure any previous commands to the CRT have been completed. The WAIT statement is not a necessity, however. In fact, there are ways to overcome the lack of either of these statements. Again, see trouble-shooting.

Still with us? Now let's introduce the game and discuss how to implement it on your system.

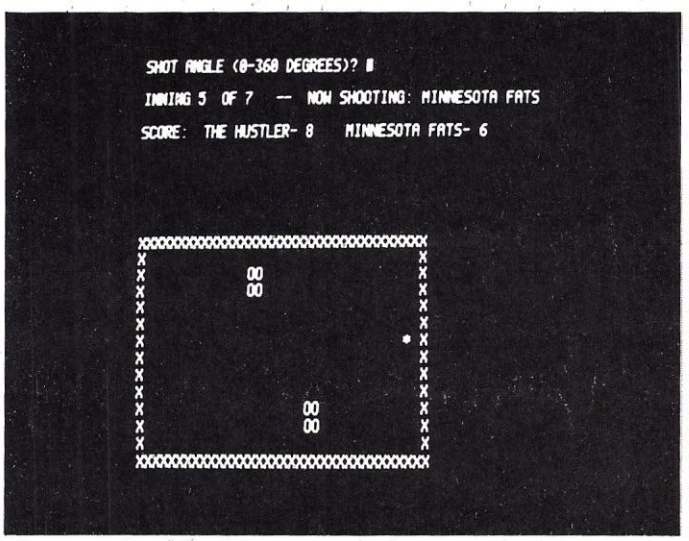
Three-Cushion Billiards

The pseudo-graphics technique is not very useful without something interesting to do with it. We have chosen to present a video game based on three-cushion billiards. For the benefit of those who have not misspent their youth around a pool hall, here is a simplified description of three-cushion billiards.

Regular billiards (as opposed to pocket billiards, or pool) is played on a table having no pockets. Only three balls are used; one is a cue ball and the other two are object balls. The shooter strikes the cue ball and attempts to have it hit each object ball during the course of the shot.

Since this was too easy for many people, a new requirement was added to the game to achieve three-cushion billiards. The cue ball must strike and bounce off the perimeter cushions of the table at least three times before the second object ball is hit. The first ball can be hit after none, one, two or three cushions are struck.

We have modified the mechanics of the game. Upon his turn to shoot, a player is shown the location of the three balls on the CRT screen. The cue ball appears as an asterisk (*) character. The object balls are each a 2 x 2 square of O characters. The player is then asked at what angle (in degrees) he would like to shoot the cue ball. (Zero degrees is horizontally to the right.)



2. Fats faces a tricky fifth shot. The cue ball is near the right-hand cushion; the two object balls are spread wide apart. The Hustler is enjoying a two-point lead after his fifth shot. Fats is pondering what shot angle might give him a maximum three-pointer.

The cursor then becomes positioned at the *. When the * disappears, the cursor, now representing the cue ball, begins to move at the angle input by the user. The cue ball reflects appropriately upon impact with a cushion. Striking an object ball is indicated by a plus (+) character where the cue ball contacts the object ball. The object balls don't move when hit. (Most game inventors would say this is to enable the shooter to predict the shot better. The truth is, however, that it is simply too cumbersome to implement.)

The shot ends when both object balls have been hit. If exactly three cushions have been hit, three points are awarded. If two or four cushions have been struck, two points are awarded. If one or five cushions have been hit, one point is given. No points are given if no cushions are struck. The shot also ends with no score if the cue ball strikes six cushions without having hit both object balls.

The game is primarily designed to be played by two contestants for an agreed number of innings (i.e., shots). It can also be used in a one-player or practice mode.

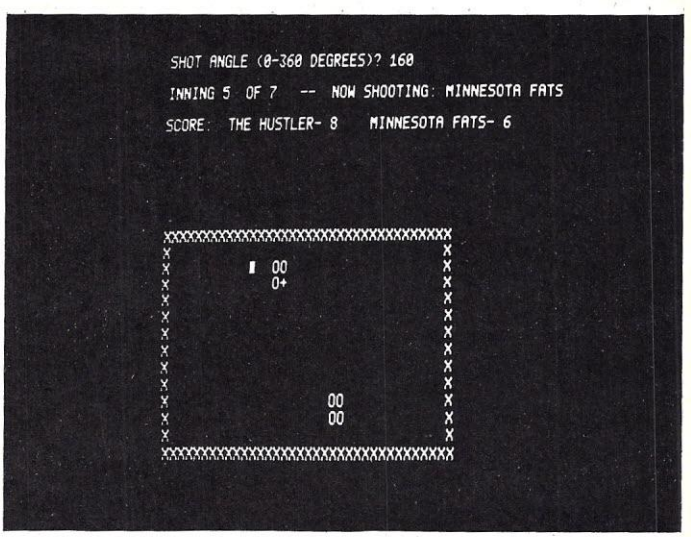
Tuning the Program

The program must be tuned to your particular system. Basically, this is a simple process. It essentially involves setting the correct decimal ASCII constants in a few key lines of the program. The program was written in a modular subroutine fashion to facilitate access to the needed changes. All user required changes will appear from line 8000 to the end.

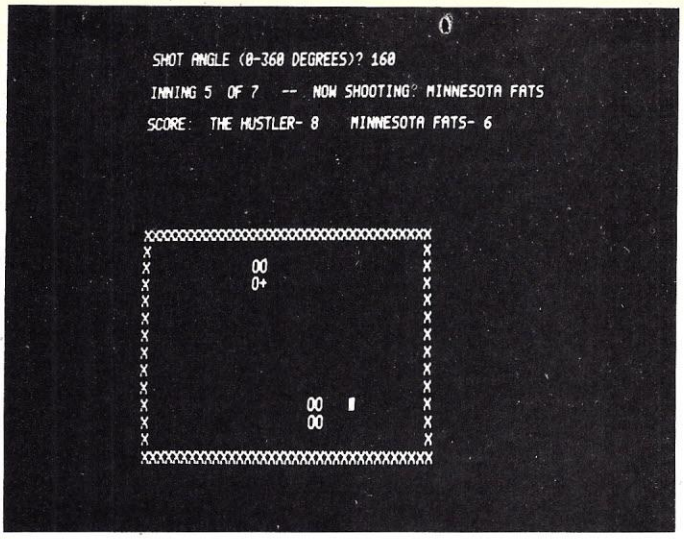
For those not familiar with the term ASCII, a brief description now follows. In order for different machines (and different parts of the same machine) to talk to each other, a correlation between bit patterns and graphic (and control) characters must be established.

One such correlation, called ASCII code, is used on most microcomputers. It assigns an alphanumeric, control or special character to each decimal number from 0 to 255. This covers all bit patterns achievable with eight bits. Some systems use seven-bit ASCII code that is defined only for the decimal numbers 0-127.

Unfortunately, there is very little standardization for what ASCII value should correspond to what cursor or screen control function among different CRT systems. The values for alphanumeric and special characters are fairly standard, however. The program listing, as presented, contains the values for a Datapoint 3300 terminal.



3. Having decided on an angle of 160 degrees, Fats watches his shot in progress. The cue ball has struck the upper object ball and is now heading toward the top cushion near the upper left-hand corner.



4. Fats is starting to smile. The cue ball, having struck the upper, left and right cushions, is heading straight for the lower object ball.

If you don't know which ASCII codes correspond to certain control functions on your system, some experimentation is in order. First, you might try running this loop:

```
10  FOR X=0 TO 255
20  FOR J=1 TO 1000:NEXT J
30  PRINT X,"(";CHR$(X);")"
40  PRINT
50  NEXT X
```

The function CHR$(X) returns the character, or control function, your system interprets for the ASCII value X.

This program will produce two columns of output. The left one will be simply the ASCII values from 0 to 255. The second column will contain a left and right parenthesis enclosing the character your system interprets for the ASCII value in the first column. A blank line is output after each "regular" line. The loop in line 20 merely slows down the output so you can more easily view what's happening.

The alphanumerics and special characters will be easy to detect. They will be plainly displayed between the two parentheses on the line with their corresponding ASCII value X.

The control functions are a little harder to determine, however. Home up will cause the output display to suddenly jump to the top of the screen. The clear function will result in the entire screen blanking out. Cursor up (cursor down) will cause the right parenthesis to be up (down) from its corresponding left parenthesis. Cursor left will cause the left parenthesis to be immediately overwritten by the right parenthesis.

On most systems, the control functions correspond to the lower ASCII values. You should be able to detect most, if not all, of them by judiciously watching the output of this program. For some ASCII values, however, you might see that something happened but not be sure exactly what. This may require running a special test to isolate the function.

It may help to merely increase the delay constant in line 20. The loop bounds in line 10 can be narrowed down to a small range around the suspected value. Perhaps an independent experiment would be useful.

For example, suppose the value of X=25 causes the left parenthesis to be overwritten by the right one. As mentioned earlier, this would seem to indicate that the ASCII value 25 corresponded to a cursor left. However, some systems have a delete function that might cause the same result. To distinguish these, try this special test:

```
PRINT"XXXXX";CHR$(25);CHR$(25);"Y"
```

If Chr$(25) does a cursor left, the output will be:

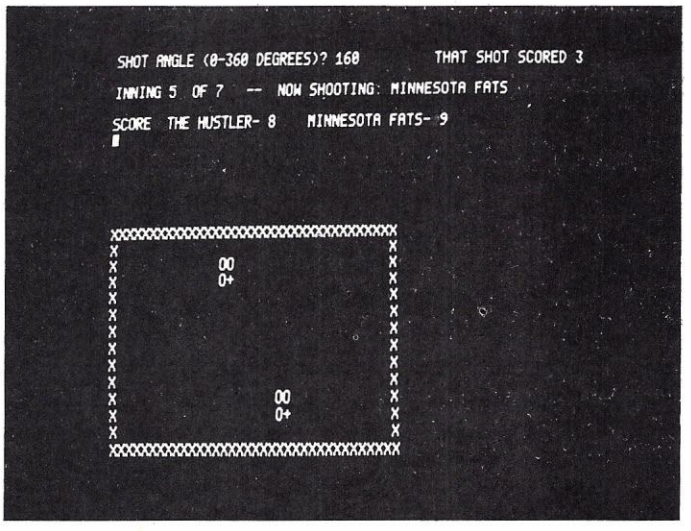
XXXYX

If CHR$(25) does a delete, the output will be:

XXXY

One final note on this subject of determining ASCII constants. Many systems support the ASC function. This returns the needed ASCII arguments directly. For example, to find the ASCII argument for the special character +, the direct statement PRINT ASC("+") will return it immediately. If your system has keys for the various control functions, try the same thing with the control key being used in place of the plus sign. Many of these may work. This is the simplest way of all to determine the correct ASCII value of each character.

OK, for the time being we will assume you know which ASCII values correspond to which control and alphanumeric functions. What's more, for now we will assume your BASIC is Altair compatible in syntax. Incompatibilities are deferred to troubleshooting.



5. Success! Both object balls have been hit and the cushion has been hit three times. The scoreboard duly reflects Fats' maximum three-pointer and indicates he has taken the lead. Has the Hustler bit off more than he can chew?

The Infamous Lines 8100-9070

Now, let's look at lines 8100-9070. During this discussion, we will indicate where, and how, to make the necessary program changes. Later, in troubleshooting, we will discuss ways to overcome certain problems or lack of capabilities in your system.

Lines 8100-8320 contain the subroutines that send the cursor movements and character displays to the screen through the OUT statements. If one character is to be sent, its ASCII code has been stored in the variable A and a GOSUB will be made to line 8100. If two characters are to be sent, the variables A and B are used with GOSUB 8200. Similarly, three characters require variables A, B, and C and GOSUB 8300. No modifications are necessary here. The WAIT statements and the OP variable in the OUT statements will be discussed soon.

GOSUB 8400 is issued whenever a home up is required by the program. For our system, the decimal number 29 corresponds to a home up and is duly set in line 8410. If your home up is a different ASCII constant, make the appropriate change on line 8410. Similarly, home down is set at the beginning of line 8610. For our system, we used the number 28. Change this if yours is different.

Clearing the screen is done in the subroutines at 8800. In our system, 31 cleared the screen, but only from the current position of the cursor down. Thus, in our routine, a GOSUB 8400 (which does a home up, remember!) is executed before setting A = 31 and the GOSUB 8100.

The time-waster routine at

LINE #	ROUTINE
400	MAIN PROGRAM
1000	INITIALIZE VARIABLES
1500	GAME SET-UP
2000	PROMPT NEXT PLAYER
2500	DRAW TABLE NX BY NY
3000	PICK BALL LOCATIONS
3500	DISPLAY BALLS
4000	GET SHOT ANGLE FROM PLAYER
4500	INITIALIZE SHOT
5000	MOVE CURSOR ONE TIME STEP
5500	CHECK FOR BALL COLLISIONS
6000	SHOT ENDS—SHOW SCORE
6500	CHECK FOR CUSHION HITS
7000	MOVE CURSOR TO LX , LY
7500	END GAME
8100	SEND ONE CHARACTER TO CRT
8200	SEND TWO CHARACTERS
8300	SEND THREE CHARACTERS
8400	DO HOME UP
8600	DO HOME DOWN
8800	CLEAR SCREEN
8900	TIME DELAY
9000	SET ASCII AND SYSTEM DEPENDENT VARIABLES

Fig. 1. Program routines by line number.

8900 is called by the main program to delay execution at a couple places. It is relatively unimportant and should require no modification.

At last we get to the nitty-gritty! In line 9040, the ASCII values for moving the cursor right, left, up and down are set to the variables R, L, U and D, respectively. The next line contains various characters and control functions. They are by variable name: X (the letter X), OH (the letter O), ST (the star or asterisk *), SP (a blank space), BL (the bell or beeper), N (no action or null), PL (the plus character +).

The only values that might need changing are N and BL; the rest are standard. N is simply no action. Several ASCII values will probably do this. If you have no device for sound on your terminal, set BL to the same value used for N. That would be too bad, however, because sound effects are incorporated in the program, just as in the big-time video stuff. *Kilobaud* is high class all the way.

On line 9060, the remaining arguments of the OUT and WAIT statements are set. The variable OP is your output port (i.e., CRT screen). IP is the input port or, more accurately, the control port. The terminology *input port* is used only because our Altair BASIC manual refers to it as such in its discussion of the WAIT statement. This reference is actually to the control port that monitors the I/O status for data ready to be sent to the output port. If you don't know these port numbers for your system, refer to trouble-shooting (hang on—we'll get there yet).

The WAIT statement is used to ensure that the following OUT transmission will not be sent until the CRT has finished any previous request. The arguments W1 and W2 of the WAIT statement are set to the appropriate values to ensure that the control port has signaled "ready." Probably these will not need changing. Refer to your system documentation if necessary.

The Pre-game Warm-up

Finally! The necessary program modifications have been made. Your palms are sweaty with anticipation. Are we ready to run yet? Well yes, almost. There are a couple questions in the program's initialization dialogue that might floor you if we don't discuss them briefly.

When you type "RUN," the program will ask the names of the players and how many (1 or 2) are taking part. Next, it requests the number of innings (or shots) each player will have in the game. No problem so far.

You are now asked to input the table length and height in units of characters. This controls the size of the billiards table, which adjusts the degree of difficulty of the game. The larger the table, the harder it is to score points. Each dimension should be at least eight. The length is limited only by the number of characters your screen holds in one line. The height should be no more than the number of lines on your screen minus six (to leave room for current game status information printed at the top of the screen).

The next question asks the user about the shape of one character cell. It requests the ratio of the length to the height of one cell. If this ratio were one, the cell would be a square. For most CRT displays, the actual value will not be one. This would cause a distortion in the cursor movement if not correct-

Program listing.

```
100 REM     ***************************************************
110 REM     *                                                 *
120 REM     *              - 3 CUSHION BILLIARDS -            *
130 REM     *                                                 *
140 REM     *  USING A PSEUDO-GRAPHICS CURSOR CONTROL TECHNIQUE *
150 REM     *                                                 *
160 REM     *    COPYRIGHT 1978 BY PHIL FELDMAN AND TOM RUGG  *
170 REM     *                                                 *
180 REM     ***************************************************
190 REM
200 REM                        IMPORTANT !!!!!
210 REM
220 REM                   SEE NOTE AFTER LINE 8000
230 REM
240 REM
400 GOSUB 1000:REM INITIALIZE REGULAR VARIABLES
410 GOSUB 9000:REM SET USER DEFINED VARIABLES
420 GOSUB 1500:REM SET UP GAME
500 P=P+1:IF P>NP THEN P=1:I=I+1
510 IF I>NI THEN 7500:REM END GAME
520 GOSUB 2000:REM PROMPT NEXT PLAYER
530 GOSUB 2500:REM DRAW TABLE
540 GOSUB 3000:REM PICK BALL LOCATIONS
550 GOSUB 3500:REM DRAW BALLS
560 GOSUB 4000:REM GET SHOT ANGLE FROM PLAYER
570 GOSUB 4500:REM INITIALIZE SHOT
700 GOSUB 5000:REM MOVE CURSOR ONE TIME STEP
710 GOSUB 5500:REM CHECK BALL COLLISIONS
720 IF NB>=3 THEN GOSUB 6000:GOTO 500:REM SHOT OVER
730 GOSUB 6500:REM CHECK IF CUSHION HIT
740 IF CU>=6 THEN GOSUB 6000:GOTO 500:REM SHOT OVER
750 GOTO 700
1000 REM ***** INITIALIZE VARIABLES
1010 RX=0:DX=0:RY=0:DY=0:TX=0:TY=0:XR=0:YU=0:CU=0:IX=0:IY=0:X1=0
1020 Y1=0:X2=0:Y2=0:A=0:B=0:NB=0:I=0:S1=0:S2=0:P=2:DIM P$(2):RETURN
1500 REM ***** SET UP GAME
1510 GOSUB 8800:GOSUB 8400:PRINT"3 CUSHION BILLIARDS":PRINT
1520 INPUT"HOW MANY PLAYERS (1 OR 2)";NP
1530 NP=INT(NP):IF NP<1 OR NP>2 THEN 1520
1540 IF NP=1 THEN INPUT"YOUR NAME";P$(1):GOTO 1560
1550 INPUT"NAME OF PLAYER ONE";P$(1):INPUT"NAME OF PLAYER TWO";P$(2)
1560 INPUT"HOW MANY INNINGS FOR THE GAME";NI
1570 INPUT"TABLE LENGTH , TABLE HEIGHT";NX,NY
1580 INPUT"CHARACTER RATIO (LENGTH TO HEIGHT)";SR:IF SR<=0 THEN 1580
1590 INPUT"A RANDOM NUMBER PLEASE";K:K=RND(-ABS(K)):XR=NX-2
1600 YU=NY-2:RETURN
2000 REM ***** PROMPT NEXT PLAYER
2010 GOSUB 8800:GOSUB 8400:PRINT"OK ";P$(P):PRINT:PRINT
2020 PRINT"        CHALK UP YOUR CUE!":GOSUB 8900:GOSUB 8800
2030 GOSUB 8400:PRINT:PRINT
2040 PRINT"INNING";I;" OF";NI;" -- NOW SHOOTING: ";P$(P):PRINT
```

```
2050 PRINT"SCORE:  ";P$(1);"-";S1;:IF NP=2 THEN PRINT"   ";P$(2);"-";S2
2060 RETURN
2500 REM ***** DRAW TABLE NX BY NY
2510 GOSUB 8600:A=X:FOR K=1 TO NX:GOSUB 8100:NEXT:A=L:B=U:C=X
2520 FOR K=1 TO NY-1:GOSUB 8300:NEXT:GOSUB 8600:A=U:B=X:C=L
2530 FOR K=1 TO NY-1:GOSUB 8300:NEXT:A=X:FOR K=1 TO NX-1:GOSUB 8100
2540 NEXT:RETURN
3000 REM ***** PICK BALL LOCATIONS
3010 X1=INT(RND(1)*(NX-3))+1:Y1=INT(RND(1)*(NY-3))+2
3020 X2=INT(RND(1)*(NX-3))+1:Y2=INT(RND(1)*(NY-3))+2
3030 K=ABS(X1-X2):Q=ABS(Y1-Y2):IF K<3 AND Q<3 THEN 3020
3040 XB=INT(RND(1)*(NX-4))+2:YB=INT(RND(1)*(NY-4))+2
3050 K=(X1-XB)↑2+(Y1-YB)↑2:IF K<4 THEN 3040
3060 K=(X2-XB)↑2+(Y2-YB)↑2:IF K<4 THEN 3040
3070 RETURN
3500 REM ***** DRAW BALLS
3510 LX=X1:LY=Y1:GOSUB 7000:A=OH:B=OH:GOSUB 8200
3520 A=L:B=L:C=D:GOSUB 8300:A=OH:B=OH:GOSUB 8200
3530 LX=X2:LY=Y2:GOSUB 7000:A=OH:B=OH:GOSUB 8200
3540 A=L:B=L:C=D:GOSUB 8300:A=OH:B=OH:GOSUB 8200
3550 LX=XB:LY=YB:GOSUB 7000:A=ST:GOSUB 8100:RETURN
4000 REM ***** GET ANGLE AND NORMALIZE IT
4010 GOSUB 8400:INPUT"SHOT ANGLE (0-360 DEGREES)";G:G=G*3.14159/180
4020 DX=COS(G):DY=SIN(G):IF SR>1 THEN DX=DX/SR
4030 IF SR<1 THEN DY=DY*SR
4040 IF ABS(DX)<0.5 AND ABS(DY)<0.5 THEN DX=DX*2:DY=DY*2:GOTO 4040
4050 RETURN
4500 REM ***** INITIALIZE SHOT
4510 LX=XB:LY=YB:GOSUB 7000:NB=0:CU=0:IX=XB:IY=YB:RX=XB+.49:RY=YB+.49
4520 GOSUB 8900:A=SP:B=L:GOSUB 8200:RETURN
5000 REM ***** MOVE CURSOR FOR ONE TIME STEP
5010 RX=RX+DX:RY=RY+DY:TX=INT(RX):TY=INT(RY)
5020 A=N:B=N:IF TX>IX THEN A=R:GOTO 5040
5030 IF TX<IX THEN A=L
5040 IF TY>IY THEN B=U:GOTO 5060
5050 IF TY<IY THEN B=D
5060 GOSUB 8200:IX=TX:IY=TY:RETURN
5500 REM ***** CHECK AND PROCESS BALL COLLISIONS
5510 IF NB>1 THEN 5540
5520 IF IX<X2 OR IX>X2+1 OR IY<Y2-1 OR IY>Y2 THEN 5540
5530 A=PL:B=L:GOSUB 8200:NB=NB+2
5540 IF NB=1 OR NB=3 THEN 5570
5550 IF IX<X1 OR IX>X1+1 OR IY<Y1-1 OR IY>Y1 THEN 5570
5560 A=PL:B=L:GOSUB 8200:NB=NB+1
5570 RETURN
6000 REM ***** SHOT OVER -- SHOW SCORE
6010 GOSUB 8400:A=R:FOR K=1 TO 40:GOSUB 8100:NEXT:SC=0
6020 IF NB<3 THEN PRINT"NO SCORE";:GOTO 6070
6030 SC=3-ABS(CU-3):PRINT"THAT SHOT SCORED";SC:IF P=1 THEN S1=S1+SC
6040 IF P=2 THEN S2=S2+SC
6050 PRINT:PRINT:PRINT:PRINT"SCORE:  ";P$(1);"-";S1;
6060 IF NP=2 THEN PRINT"   ";P$(2);"-";S2
6070 FOR Q=1 TO 3:GOSUB 8900:NEXT:RETURN
6500 REM ***** PROCESS CUSHION HITS
6510 IF IX>1 AND IX<XR THEN 6530
6520 CU=CU+1:A=BL:GOSUB 8100:DX=-DX
6530 IF IY>1 AND IY<YU THEN 6550
6540 CU=CU+1:A=BL:GOSUB 8100:DY=-DY
6550 RETURN
7000 REM ***** MOVE CURSOR TO LX,LY
7010 GOSUB 8600:A=R:FOR K=1 TO LX:GOSUB 8100:NEXT
7020 A=U:FOR K=1 TO LY:GOSUB 8100:NEXT:RETURN
7500 REM ***** MOPUP -- END GAME
7510 PRINT:PRINT:PRINT TAB(20);"THAT'S IT -- GOOD GAME!   ":STOP
8000 REM
8010 REM      ******** NOTE! - NOTE! - NOTE! - NOTE! ********
8020 REM      *                                            *
8030 REM      *    ALL VARIABLES FROM HERE TO THE END OF   *
8040 REM      *    THE PROGRAM MUST BE SET BY THE USER     *
8050 REM      *    TO MATCH HIS SYSTEM                     *
8060 REM      *                                            *
8070 REM      *        -- SEE KILOBAUD ARTICLE --          *
8080 REM      *                                            *
8090 REM      **********************************************
8095 REM
8100 REM ***** SEND ONE CHARACTER IN VARIABLE A
8110 WAIT IP,W1,W2:OUT OP,A:RETURN
8200 REM ***** SEND TWO CHARACTERS IN VARIABLES A,B
8210 WAIT IP,W1,W2:OUT OP,A:WAIT IP,W1,W2:OUT OP,B:RETURN
8300 REM ***** SEND THREE CHARACTERS IN VARIABLES A,B,C
8310 WAIT IP,W1,W2:OUT OP,A:WAIT IP,W1,W2:OUT OP,B
8320 WAIT IP,W1,W2:OUT OP,C:RETURN
8400 REM ***** HOME UP
8410 A=29:GOSUB 8100:RETURN
8600 REM ***** HOME DOWN
8610 A=28:GOSUB 8100:RETURN
8800 REM ***** CLEAR SCREEN
8810 GOSUB 8400:A=31:GOSUB 8100:RETURN
8900 REM ***** TIME WASTER ROUTINE
8910 FOR K=1 TO 400:NEXT:RETURN
8920 REM
9000 REM *****       THE FOLLOWING VARIABLES ARE SET TO THE DECIMAL
9010 REM *****    EQUIVALENT OF THEIR ASCII CODE.  THESE ARE CURSOR
9020 REM *****    CONTROL COMMANDS.  SEE KILOBAUD ARTICLE.
9030 REM
9040 R=24:L=25:U=26:D=27:REM MOVE CURSOR RIGHT, LEFT, UP, DOWN
9050 X=88:OH=79:ST=42:SP=32:BL=7:N=0:PL=43:REM X,O,*,SPACE,BELL,NULL,+
9060 OP=1:IP=0:W1=128:W2=128:REM OUTPUT,INPUT PORTS, WAIT 1, WAIT 2
9070 RETURN
```

ed by the program. For example, you would think of a 45-degree angle as a series of cursor movements, one to the right followed by one up. But if the physical length of the movements to the right were not equal to the vertical movement, the apparent angle would become skewed and would not appear correct. The program is able to adjust for this when given the requested ratio.

The best way to determine the ratio for your CRT is as follows. Create the outline of a large square (e.g., a 15 x 15 figure of the character O) on your CRT display. Now measure the actual length and height of this square by using a ruler or tape measure. (Measurements should be from the center of a corner O character to the center of the O character at the appropriate other corner.)

Divide the length of the square by the height to obtain the character ratio requested. In fact, once you have it determined for your system, you might change line 1580 to read simply

```
1580 SR = 0.52
```

or whatever constant you have determined.

Last, the dialogue requests the ubiquitous random number to initialize its random-number sequence. See if you can input one you've never used before. Each shot is set up randomly by the program. And with that the game begins, and the palms become even more sweaty.

Troubleshooting

We've put off troubleshooting as long as possible. Now it's time to "fess up." Here are, we hope, most potential problems discussed in a question-and-answer format.

Q: What if I'm missing home up or home down?

A: This is no problem as long as you at least have one of them. A home up could be accomplished by a home down followed by the necessary number of cursor up commands. This would necessitate modifying line 8410. For example, on a system with 22 lines of video output, the new code would be: 8410

GOSUB 8600:A = U:FOR K = 1 TO 21:GOSUB 8100:NEXT:RETURN. In a similar fashion, line 8610 would be modified for a system having no home down.

Q: How about no clear screen function?

A: Almost every system with the other control functions should have this capability. If not, it can be simulated with a home up followed by printing enough blanks to clear the screen. The necessary changes are to be made in line 8810.

Q: What special BASIC functions are used?

A: Nothing exotic. Two-letter variable names are used freely. One small string array occurs. The RND, SIN and COS functions are required. The OUT and WAIT statements are the heart of the technique, which brings us to the next question.

Q: What if I'm having trouble with WAIT, OUT and/or I/O ports?

A: If it's simply not knowing your output and/or input (control) port numbers, it's time for a little research. Dust off those manuals (BASIC and hardware) and search. See if you can ask someone with similar equipment. At worst, you can try various numbers for the variables OP and IP. The arguments W1 and W2 of the WAIT statement depend on how your hardware works. Again, consult those trusty manuals.

The function of each WAIT statement is simply to ensure that the CRT is ready for the subsequent transmission of the ensuing OUT statement. If the arguments of the WAIT statements are causing problems, a little time-waster loop can be substituted for each WAIT. Try replacing each WAIT IP,W1,W2 with the two statements FOR Q = 1 TO 10:NEXT. The loop constant 10 is only a starting guess. Its value depends on the speeds of your hardware and software. The number should be large enough to ensure the subsequent OUT will properly work, yet small enough not to waste unnecessary time. You will have to determine this by trial and error. The substitutions are to be made in lines 8110, 8210, 8310 and 8320.

Sharp-eyed readers may be wondering if PRINT CHR$ could be used in place of each pair of WAIT and OUT statements. The answer is yes, sort of. Here's the problem. After several such successive commands on most machines, the hardware/software issues an automatic carriage return and line feed. This corresponds, of course, to the system's thinking a full line of text has been issued.

However, if WAIT and/or OUT are causing problems try the coding changes in Example 1. Don't forget those semicolons. If you can control the terminal width as an input to BASIC, set it to the maximum. This coding is cleaner, avoiding all problems with port numbers and WAIT arguments.

Q: How much memory is required?

A: The program was written in Altair 8K BASIC, version 3.2. As such, BASIC and the program just fit inside 12K on our system. If it overflows on your system and you need to squeeze out a little more space, here's how. The REM statements before line 1000 can be deleted. From line 1000 on, the text after each REM can be removed. However, these latter REM statements must be retained because they are branched to by other statements.

Q: What if my cursor character is inadequate, or I have no cursor?

A: This is remedied by the coding in Example 2. Of course, all the cursor control functions must be available. This coding uses the * as the cue ball.

Q: My friend beats me all the time. What should I do?

A: Go back to Star Trek.

Q: Why does the ball move too fast or too slow?

A: The baud rate of your terminal and quickness of BASIC will determine the speed of the ball. If it moves too fast, add the following time waster:

```
5005 FOR K = 1 TO 100:NEXT
```

If 100 does not do the trick, adjust it appropriately. You might need to increase the number 400 in line 8910 also. If things are too slow, not much can be done. The action is limited by the ability of BASIC to do its thing. Altair 8K BASIC was just fast enough to drive our terminal at 30 cps. A faster baud rate would not appreciably change the ball speed.

Q: My CRT resolution is too crude. What's the solution?

A: Not too much can be done about this. If you need a few more cells in the vertical direction, two blank lines of the scoreboard can be removed. To do this, remove the last isolated PRINT statement from line 2030 and line 2040. Also remove the first two PRINT statements from line 6050.

Q: But what if I still can't get it to work?

A: All we can say is do the following, roughly in this order: Try again. Ask a friend for help. Send us a nice letter. Send us a nasty letter. Buy a $5000 video system. Take up another hobby.

A Final Word

We hope this pseudo-graphics cursor control technique adds a new dimension to your computer system. There are many other applications for it.

A note to those lazy folks out there. We can provide a cassette tape of the program for $5. It will be created with Altair 8K BASIC version 3.2 in Tarbell format.

Late Flash for PET Owners

The program changes in Fig. 2 will produce a working version for the Commodore PET.

Since it is a reserved variable, ST in the original listing is changed to AS in these PET modifications. This version will work fine on the PET. However, some additional cosmetic changes and some reformulation would improve its "playability" even more. For $5 we can supply a cassette of an improved version for the PET. This version, among other things, incorporates more of the PET's graphic capabilities. ■

```
3550  LX = XB:LY = YB:GOSUB 7000:A = AS:GOSUB 8100:RETURN
5060  GOSUB 8200:IX = TX:IY = TY
5070  A = AS:B = L:GOSUB 8200
5080  A = SP:B = L:GOSUB 8200:RETURN
6010  GOSUB 8400:SC = 0:PRINT
6050  PRINT:PRINT:PRINT"SCORE: ";P$(1);"-";S1
8110  PRINT CHR$(A);:RETURN
8210  PRINT CHR$(A);CHR$(B);:RETURN
8310  PRINT CHR$(A);CHR$(B);
8320  PRINT CHR$(C);:RETURN
8410  A = 19:GOSUB 8100:RETURN
8610  GOSUB 8400:A = 17:FOR K = 1 TO 24:GOSUB 8100:NEXT:RETURN
8810  A = 147:GOSUB 8100:RETURN
8910  FOR K = 1 TO 2000:NEXT:RETURN
9040  R = 29:L = 157:U = 145:D = 17
9050  X = 88:OH = 79:AS = 42:SP = 32:BL = 0:N = 0:PL = 43
9060  REM
```

Fig. 2.

```
8110  PRINT CHR$(A);:RETURN
8210  PRINT CHR$(A);:PRINT CHR$(B);:RETURN
8310  PRINT CHR$(A);:PRINT CHR$(B);
8320  PRINT CHR$(C);:RETURN
```

Example 1.

```
5060  GOSUB 8200:IX = TX:IY = TY
5070  A = ST:B = L:GOSUB 8200:RETURN
```

Example 2.

The BCS and Its President

As president of the Boston Computer Society, Jonathan Rotenberg is, in effect, a lobbyist for the microcomputer industry. Yet in spite of this responsibility, he doesn't even vote.

Dennis Brisson
John Barry
Kilobaud *Staff*

A few months ago, we received, and eventually bought, a program/article from a guy named Jonathan Rotenberg. Aside from noticing that he was president of an organization called the Boston Computer Society, we didn't see anything particularly unusual or striking about the author or the article—after all, we receive scores of manuscripts every month.

A while later, we received another correspondence from Mr. Rotenberg. Like the cover letter that had accompanied the article, and the article itself, this letter was extremely literate, coherent and well presented . . . not a big deal. However, the final paragraph read, in part: "Maybe it would be interesting for me to mention that when I submitted 'Ultra Banner' I was 14 (now I'm 15)." The letter was mailed from a summer camp on Cape Cod and written on Boston Computer Society stationery.

We knew from a press release that the Boston Computer Society was sponsoring a Home/Business Computers show in October at Boston University, so we decided to take a trip to Boston to find out more about Jonathan Rotenberg and the BCS.

* * *

In this age of the miracle chip, when "think small" is the keyword of every member of the microcomputer set, a recent happening, Home/Business Computers '78, may give a boost—in a big way—to Jonathan Rotenberg and to microcomputing in general in the Boston area.

Buoyed by the success of the first Boston Computer Society (BCS)-sponsored exhibit, Rotenberg, the show's organizer and president of the BCS, sees the exposition as becoming an annual event. While other aspiring entrepreneurs have optimistically envisioned similar undertakings after organizing a well-attended first show—only to fail miserably in succeeding attempts—Rotenberg, at age 15, has nowhere to go but up.

By Rotenberg's estimate, Computers '78 attracted about 1000 attendees, mostly novices to the microcomputer phenomenon. "About six months ago, we (the BCS) began to realize that we were not really handling the needs of the general public very well to disperse information about what's going on in the computer field. Our meetings catered very well to hobbyists, but not to the general public. So we developed the idea for Home/Business Computers '78 to direct it toward the general public."

Computer Crusader

Jonathan's enthusiasm for the prospects of computer applications is catching. He took to computers eagerly and at an early age and, with a vision of unlimited growth for the industry, set out to spread the good word about microcomputing. He admits that now "computers are a major part of my life."

To the uninitiated, Jonathan's excitement about the future uses of microcomputers may be difficult to understand. Indeed, those outside the computer priesthood are not privy to the intricacies and capabilities of memory storage, baud rates, buffers and buses. There appears to be an aura of mystery, misunderstanding and suspicion surrounding the use of computers. Perhaps much of the prejudice is based on a fear of the brute reasoning power of computers.

"In the past I have faced an awful lot of prejudice directed toward the use of computers. People envision computers as massive dehumanizing machines tended by large corporations running checking accounts, taking over their lives and depersonalizing everyone to a number. I think that's rather unfortunate. I see personal computers as inevitable, and people should understand them."

The difficulty of dispelling false impressions associated with computers has been compounded by the type of person the industry can attract. "I've found that a lot of weird people can become involved in computing simply because it seems to be a good way to get them away from other people that they can't deal with," says Jonathan. He is particularly concerned with the image of the "child of the microage," that is, the young computer user. "The problem is that there are a lot of young microcomputer users that tend to be pretentious and overbearing," he frets. While he is certainly young, Jonathan is neither pretentious nor overbearing.

Jonathan is a highly motivated phenom who appears bent on a one-man crusade to gather as many converts to the microcomputer religion as possible. Under his leadership, the Boston Computer Society has grown from "about 80 people" before the show to "over 220" members since. The faithful include hobbyists, professionals and personal computer users. More converts are on the way. He even has aspirations of convincing the Boston Water and Sewer Commission to join the fold of microcomputer users. He has presented a preliminary proposal—initially turned down by the Commission—to have a microcomputer handle its over 90,000 billing accounts. Although the Commission appears likely to opt for a larger computer system, Jonathan is ever ready to defend his micro approach to computing.

"I see the situation as a little bit different. Microcomputers are different from bigger computers and you can do very different things with them. For instance, in many cases it could be very practical to buy two microcomputers and use one as a spare if the first breaks down. Now obviously you could never do that with the IBM 360. Since microcomputers are so inexpensive—and just as capable as minicomputers—any business considering buying a mini could easily justify the purchase of a more powerful micro."

Jonathan's faith in computing dates back to 1972—he was

nine years old at the time—when he attended a six-week computer programming course. This was the only structured teaching in computing he received; the remainder of his education came from books and from talking with people with computer experience.

Following Childe Jonathan's conversion to computing, he set out on a pilgrimage to learn all he could about computers. "I spent the next two years frantically trying to find computer access. I read some informative books, and the idea of computer programming became exciting. I slowly developed programming styles and techniques as I gradually found computers on which I could run programs I had written."

However, he soon realized that the industry lacked an easy-to-understand instructional book on programming, so he took it upon himself to write one. Although his effort, *Programming in BASIC*, was never published, it was passed on—via mimeographed copies—to over 100 friends and interested beginning programmers. The book is significant in that, besides being a creditable undertaking of a difficult topic by a seventh-grader, it is written in English, rather than computer jargon, and includes various kinds of quizzes and exercises in an attempt "to make programming fun and understandable."

Early Signs of Promise

Jonathan's talent for computing became apparent at the age of nine when he wrote his first computer program. He then began writing various programs and developed his skills to tackle more complicated programming tasks. He estimates that he has written "hundreds of programs," including assorted accounting, graphics, business, demonstration, educational drilling and teaching programs. (His "Ultra Banner" program will appear in *Kilobaud* later this year.) He has programmed on maxi, mini and microcomputers but is most excited about micros because of their low cost and versatility and the technological breakthroughs occurring every day in the microcomputer field.

At the ripe old age of 13, he landed a summer job at a data-processing center on Cape Cod, where, Jonathan says, after his first summer there, "I guess they were impressed with my performance because they asked me back the following summer." He was instrumental in introducing the staff to the capabilities of microcomputing. He has also taught programming, as well as some computer design, to high-school students and to summer campers. At both the high school and summer camp, Jonathan, after researching the systems, drawing up cost- and time-effective analyses and presenting his detailed findings to the respective institutions, was the driving force in convincing the institutions to explore programming. He sold the camp on renting a Wang computer, and eventually on buying a PET.

A brief look at Jonathan's family background may help explain his motivations and skills. His mother runs a retail store and has an art background. He points out that he does advertising, design and layout for the BCS—he organized most of the promotional work for the show—saying, "I didn't use computer type-styles. I wanted to give the impression that human beings are involved."

Jonathan's father is in real estate and owns a motel. The son is now trying to convince the father to use computers in his business. He would like to organize a "huge TRS-80 system" to help in the motel's management.

At times Jonathan sounds overeager about the prospects for computer advances. However, he has nurtured this youthful optimism, seasoned with years of experience, into a mature and realistic approach to the future of microcomputing.

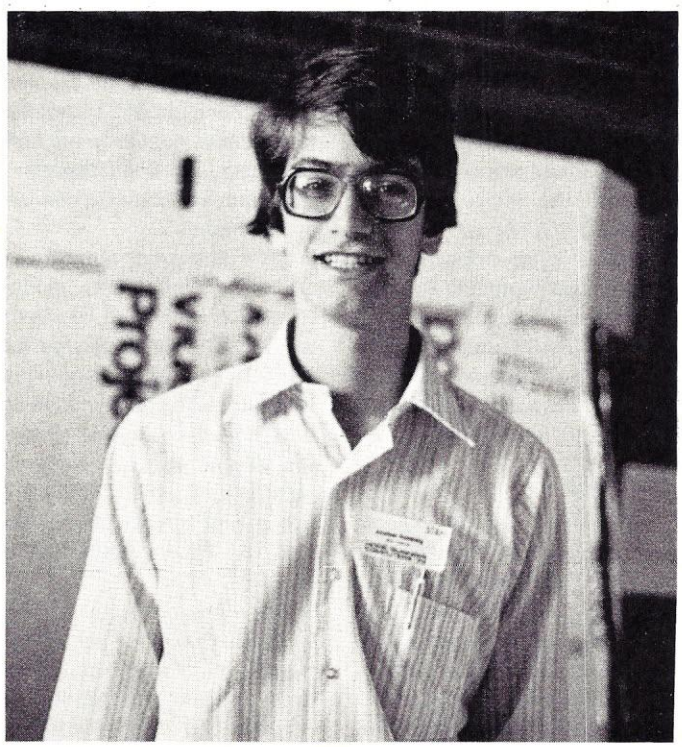
In response to criticism of the lack of software for microcomputers, thus making them impractical in light of minicomputer capabilities, Jonathan predicts that the spawning microcomputer industry will give rise to a whole new industry of software consultants to custom-program.

"I see the need for a consultant as an integral part of a microcomputer that arranges all of the hardware, service and software needs. I don't think that there can ever be canned software that will be ideal for the application. As programmers become more plentiful—and particularly the way things seem to have started in microcomputing—you wouldn't pay someone $50 per hour to do programming like you would with large computers. Also, microcomputing is much easier. I think there is certainly a definite need for canned software, but I think there is more of a need for this sort of all-inclusive consultant."

Jonathan on the future uses of microcomputers: "I think the microcomputer situation is coming into a very fuzzy turning point. The majority of computer use in the home is for game playing, particularly influenced by advertisements for things that look like computers, such as TV games. But I think that's starting to change. People are doing more practical things with computers. I think that probably in another two years the change will be very definite."

The Boston Computer Society

Through the realization that "there was very little information available to microcomputer users in the Boston area," Jonathan formulated the idea for a Boston-based computer society. Despite the Hub City's reputation as a beehive of intellectual stimuli, there wasn't much organized activity for the computer user. Jonathan asserts, "People assume that with all the colleges in the city, there must be activity available. But the fact is that most of the computer-related groups at the schools are very self-sufficient. In fact, we get very few students at our monthly meetings." (He indicated that he wouldn't want to see nothing but technically oriented college students at the show.) He goes on to cite that computer people, on the whole, tend to be very independent, and it has been his experience that most people don't like to commit themselves to any sort of organizational club or information ser-



Jonathan Rotenberg: overcoming prejudice.

vice. But that has started to change. As the growth of the industry has increased and more people have purchased computers, a new breed—more open to an exchange of computer-related ideas and applications—has emerged.

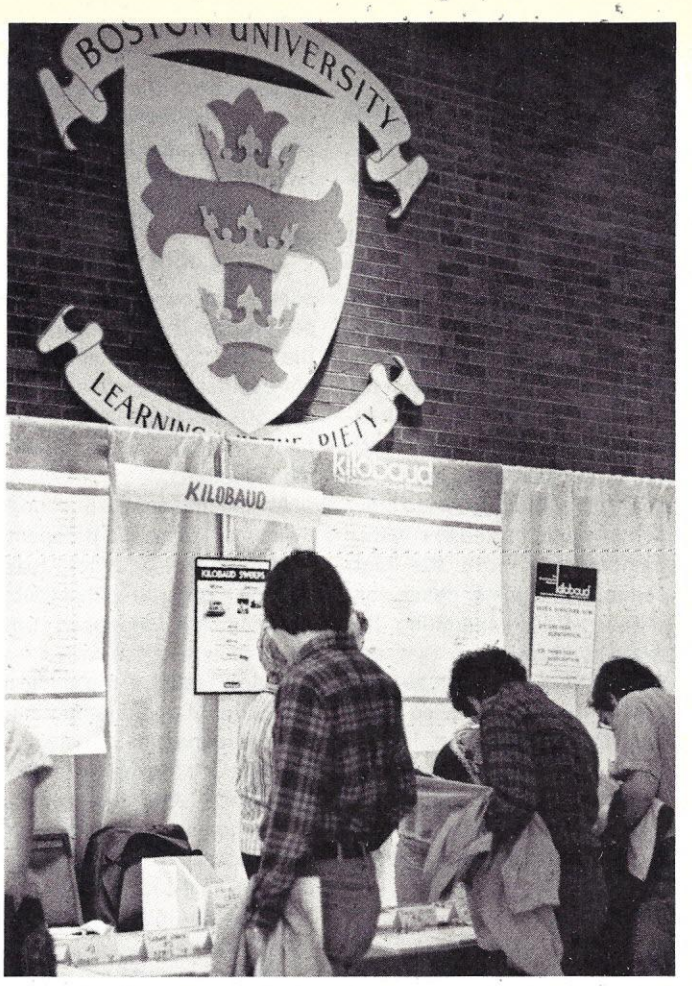
Together with noted Boston computer activist Richard Gardner, Jonathan formed the local computer club, which held its first meeting in January 1977. After only the second meeting, Jonathan found that the presidency of the chapter was thrust upon him after Gardner's "interests changed" as his time was taken up with other projects.

Jonathan recalls that, at the age of 13, having never chaired a meeting, he was understandably nervous. He laments, "It was very discouraging because no one was devoting any time to the club, so I was doing everything. I just kept asking myself, 'was it really worth it?' I stuck with it." Jonathan admits that his term as president, while initially a one-man show, has been made easier with the recent formation of a board of overseers.

The monthly meetings feature guest speakers, various information exchanges, free literature, magazines, etc. Because BCS is based upon the constantly changing needs of its members, the program varies at each meeting. "We are constantly updating our services to provide as much information as possible to computer users," he states.

Indeed, Jonathan is continually working toward making the club bigger and better with plans for a newsletter, users groups and even the formation of "Boston Computer Society International," an idea that has met with some resistance from some members who prefer the "homey" quality of the present meetings. "What I'm trying to do now is see if I can handle both goals at once—give people whatever information they want and still retain a comfortable, cozy atmosphere. It's been working pretty well," he boasts.

As the industry has changed, so has the type of attendee at the monthly meetings. "Personal" users now outnumber the hobbyist and businessman. Jonathan muses, "I see the Boston Computer Society now as a middle-of-the-road club—in between the neophyte and the advanced computer hobbyist. For the more advanced, technical computer hobbyist, the best service around is probably the New England Computer Society." (Located in Bedford MA, NEC features a newsletter and "special interest groups to conduct projects and discuss topics in depth.")



One of the exhibits at Home/Business Computers '78.

The Show

Computers '78, by far the club's most ambitious undertaking, was initially viewed as a service by the club, rather than a money-making proposition. Fee charges for the show were nominal ($25 for a booth and $2 general admission charge). The club netted $600, according to Jonathan.

Attendance at the show was described as "very comfortable"—not too crowded but with enough interested onlookers to keep the exhibitors on their feet all day. The problem of attracting enough customers to the show, geared to the first-time user, while not appearing too commercial was a concern of Jonathan's.

"We took great pains to invite only high-quality exhibitors. From our point of view it was an information service, but it has to be profitable and useful for the exhibitors or else we have not done our job." (One of the exhibitors was *Kilobaud* publisher, Wayne Green, who noted that subscription sales were relatively substantial at the show.)

The show has been the culmination (so far) of Jonathan's interest in computers, which grew out of a "fascination" at an early age "with things with buttons." Since then, he has mastered the controls to overcome the barriers that one so young and so talented can face in the computer business world. Although he still has a year of high school remaining, and then perhaps years of college before him, he gives the impression of one much older.

"My primary goal in a business transaction is to let people know that I'm a responsible person, someone who knows what he's doing and people can have confidence in. I like to do things well—I'm a perfectionist. If something's not the best it can be, I'm not satisfied.

The Spice of Life

What's in store for Jonathan? When he is not busy programming at the keyboard, Jonathan is tackling some sort of computer-related organizational job, such as Computers '78. He sees himself as an organizer and a programmer, but has become more of an organizer than a computer user; he now only writes programs as they are needed for applications.

As evidence that he's "liked taking on big organizational things": Jonathan persuaded a major computer company to underwrite most of the show's operating expenses. As we talked, BCS members approached their president to ask his advice on logistical, scheduling and other matters. He was very busy.

It could be difficult for one so young who has accomplished so much to catalog his achievements unassumingly. Jonathan is honest yet modest about his accomplishments. He's also a nice kid.

With his proclivity toward computers, Jonathan seems destined to become a computer technician, programmer or consultant or land some "big organizational job." For now, however, he dares to tempt fate and adamantly predicts, "I keep telling myself, no, I'm going into some other field." Another field he has gone into is magic. "Professional Magic, Amateur Prices" reads his business card. A "mostly self-taught" magician, he gave his first professional show at age 11.

A nearly monomaniacal ap-

proach seems, in Jonathan's case, to be the key to diversity. "When I get involved in something, I tend to give it priority over everything else." This attitude has paid off. Balancing his time among his myriad interests illustrates his legerdemain talents.

Computer user, programmer, teacher, author, organizer, magician, Rotenberg is a Renaissance man/child in the computer field. "The thing I consider most important is to know as much as I can about everything about computers. This is where I am particularly different from a lot of other people who have their specialization in hardware or software. It's been very useful because I'm able to talk with anyone and answer any questions that people might ask . . . or if someone is telling me something, I'm able to understand and offer additional information."

As both computer user and organizer, Jonathan's accomplishments, knowledge of computers and the mature and responsible manner in which he deals with people belie his age. He admits to having developed a "phone voice" and doing as much correspondence as possible by mail in order to disguise his youth.

How does a fifteen-year-old confront corporations and businessmen when organizing for an event? "I've had trouble in the past with people who would feel a little uneasy if I'm talking about something that might cost them money. I have to give the impression a lot of the time that I am a businessman. About 99 percent of the time my phone voice is convincing." In fact, many of the exhibitors at Computers '78 had never personally met the young organizer, and when Jonathan introduced himself to the exhibitors before the show, some were momentarily taken aback.

Up to now, Jonathan has resisted the temptation, at the urgings of his friends, to "go national" with his computer exposition. However, with this year's success, you may run into Jonathan on the circuit next year. Even before the show, Jonathan predicted that he would move his show, held this year at Boston University's student union, to more spacious quarters next year. Jonathan's prediction, not to be lightly dismissed as the boasting of a brash upstart, is backed by his consummate organizational ability and seasoned, despite his youth, by a mature understanding of the transient nature of this fast-growing and ever-changing industry. Jonathan, like the microcomputer industry, has come of age.■

✓ *Reader Service—see page 147*

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Address List Editor

Back in October (page 102) we told you to keep an eye out for this article. Here it is.

The editor program described in this article complements the Address List Program that appeared in the October 1978 issue of *Kilobaud* ("A Useful Address List Program," p. 102).

The program allows you to prepare an address list and record it on cassette tape in a format appropriate for later loading directly into the address list program. In addition, it allows you to update your taped address list by: changing names, addresses, telephone numbers and birth dates; adding or deleting correspondents; and preparing a cassette tape record of your original and revised address lists.

If you correspond with only a small number of people, you might consider configuring your address list program to introduce addressee information via DATA/READ statements.

But if you have a large personal correspondence list or if you intend using your taped address program in connection with a social club's membership list or as a small business's customer file, you will certainly appreciate the value of being able to revise your file without having to retype it.

The editor program prompts you through each step of the address list construction process (see Samples 1 through 5). If you follow the instruction sequence that appears on your computer system's video monitor, you should experience no difficulty in producing a taped catalog of correspondents that will be compatible with the address list program.

Tailoring the Program

If you wish, you can reduce the temporary (RAM) memory requirements of the program by removing individual parts or by excising entire sections of the editor program.

For example, if you merely want to prepare a tape containing names, addresses, telephone numbers and birth dates to feed into your address list program and forego the edit capability, you can eliminate these options: edit information; delete an addressee; add an addressee; and read address list from tape.

Those deletions would substantially cut the program's memory requirements. However, by so doing, you would give up the capability of updating your master list by making needed changes. The probable alternative: retype the entire list.

Again, if you must cut the program because of memory limitations in your particular system, the editor program's modular construction will help you do it. Line 300 tells you where to find the various modules. For example, the "edit information in list" option begins at line 660 and ends at line 1150; the "delete addressee" option begins at line 1160 and ends at line 1350; etc.

If your working memory space is small after you load BASIC and the editor program, you can limit the quantity of address data you place into memory at any one time. Merely indicate approximately how many names your remaining memory bank can accommodate, and the program will remind you to transfer to tape the information you have typed in at your keyboard when you have reached your self-imposed limit.

Lines 140 to 160 ask you to define the data input limit. Line 170 adds a few bytes to the designated limit so that you can use the "add names to list" option without mishap. Lines 1410 to 1440 include a reminder to record (dump to tape) the block of names in memory, thereby freeing space needed for the next block of names. Line 1440 "transfers" you to line 190 so that you can select option 6, "copy list in memory to tape" and, thereby, record your list of correspondents on cassette tape.

Throughout the program (lines 190, 320, 360, etc.) you will find statements "PRINT CHR$(16), CHR$(22)." These commands cause the computer system's cursor to "home up" (jump to the upper left corner of the video monitor's screen) and cause all information appearing on the face of the CRT to be erased (erase to end of frame). If you use the scroll mode of presentation with your monitor or use a printer as your output device, you can remove all such statements and save program memory.

Exercise Care

If you decide to remove all cursor control and clear screen commands, do so carefully. If other statements, commands or functions presently share program lines with the "PRINT CHR$(16), CHR$(22)" statements, be sure to leave them there. Furthermore, try to avoid eliminating any program line number until you have checked to be sure that the line number

```
TYPE THE NUMBER OF NAMES YOU WANT TO READ
FROM TAPE--OR RECORD ON TAPE--AT ONE TIME.

HOW MANY NAMES ? 5


TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
         1--PREPARE A NEW ADDRESS LIST
         2--EDIT INFORMATION IN LIST
         3--DELETE AN ADDRESSEE
         4--ADD AN ADDRESSEE TO LIST
         5--LIST ALL ADDRESSEES
         6--COPY LIST IN MEMORY TO TAPE
         7--READ ADDRESS LIST FROM TAPE
         8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 1


TYPE NAME USING THIS PATTERN: LAST NAME, FIRST
NAME, MI.(XXXXXX;XXXX X.). PLACE A '*' IMMEDIATELY
AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST

TYPE '9' IF THERE ARE NO MORE NAMES
TO BE ADDED TO YOUR LIST.

NAME ? ABLE; FRANK R.*


TYPE STREET ADDRESS--PATTERN NOT IMPORTANT

STREET ADDRESS ? 123 RANDOLPH RD.


TYPE CITY; STATE AND ZIP CODE
USING THIS PATTERN: XXXXX;XX.XXXXX

CITY;STATE AND ZIP CODE ? ATLANTA;GA.33333


TYPE PHONE NUMBER--PATTERN NOT IMPORTANT
IF PHONE NUMBER IS NOT KNOWN, HIT 'RETURN' KEY

PHONE NUMBER ? 400/555-5555


TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:
XX-XX-XX.  IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00

BIRTHDATE ? 03-23-45


IF NEXT PERSON TO BE LISTED LIVES WITH LAST ADDRESSEE
ENTERED, TYPE A 'Y'; OTHERWISE HIT 'RETURN' KEY

'Y' OR 'RETURN' ? Y


TYPE NAME USING THIS PATTERN: LAST NAME, FIRST
NAME, MI.(XXXXXX;XXXX X.). PLACE A '*' IMMEDIATELY
AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST

TYPE '9' IF THERE ARE NO MORE NAMES
TO BE ADDED TO YOUR LIST.

NAME ? ABLE; RUTH C.


TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:
XX-XX-XX.  IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00

BIRTHDATE ? 12-22-46
```

Sample 1. Program printout showing how address list is prepared using editor program. Underlined entries indicate operator responses to program questions.

to be removed is not referred to elsewhere in the program.

If, despite your caution, you happen to eliminate a line number that is needed, relax. Your computer will call the oversight to your attention when you "RUN" the program by sending a "line number not found" error message. You will be able to correct the problem at that time.

Note that a semicolon separates the last name from the first name (line 370) and also separates the city name from the state abbreviation (line 470). Although commas would have been the preferred punctuation in both instances, the BASIC interpreter did not permit it. SWTP BASIC has been programmed to consider a comma as signaling the end (terminator) of a string variable entered in response to an INPUT statement.

If you want to type a comma after your correspondent's last name (line 370), test your BASIC version to see whether it causes you to lose the first name. If a comma terminates your entry, type a semicolon, dash, colon or some other character after you type the surname. You will meet the same problem when you enter your correspondent's city, state and zip code (line 470). Unless your version of BASIC permits it, do not type a comma after you enter the name of your addressee's city.

If you forget and proceed to type commas in either of these two places—it's the natural thing to do—you will notice truncated (shortened) names or addresses appearing on your monitor's screen whenever you run the program. When you see that result (assuming that you haven't exceeded the allowable length of your string variables), you will know why the truncation occurred.

Notice in line 470 that the city, state and zip code entry pattern requires the use of a two-letter abbreviation for the state's name. Since not everyone is familiar with all of the official two-letter state abbreviations, we have included a list of state abbreviations approved by the U.S. Postal Service (see Table 1).

This editor program requires you to follow closely the designated city, state and zip code pattern. The pattern is: city name, semicolon, two-letter state abbreviation, period (or

```
TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
         1--PREPARE A NEW ADDRESS LIST
         2--EDIT INFORMATION IN LIST
         3--DELETE AN ADDRESSEE
         4--ADD AN ADDRESSEE TO LIST
         5--LIST ALL ADDRESSEES
         6--COPY LIST IN MEMORY TO TAPE
         7--READ ADDRESS LIST FROM TAPE
         8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 2


WHICH ADDRESSEE NUMBER IN YOUR LIST DO YOU WISH TO EDIT?

ADDRESSEE LIST NUMBER ? 2


TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS
TO INDICATE THE ELEMENT YOU WISH TO EDIT:


1--NAME OR XMAS CARD LIST CODE
2--ADDRESS
3--PHONE NUMBER
4--BIRTHDATE
5--END EDIT OPERATION

INSTRUCTION NUMBER ? 1


ABLE; RUTH C.
TYPE NAME USING PATTERN: XXXXX;XXXXX X.

IF PERSON NAMED IS ON YOUR XMAS CARD MAILING
LIST, ADD '*' IMMEDIATELY AFTER THE NAME.


NAME ? ABLE; RUTH C. *



WHICH ADDRESSEE NUMBER IN YOUR LIST DO YOU WISH TO EDIT?

ADDRESSEE LIST NUMBER ? 1


TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS
TO INDICATE THE ELEMENT YOU WISH TO EDIT:


1--NAME OR XMAS CARD LIST CODE
2--ADDRESS
3--PHONE NUMBER
4--BIRTHDATE
5--END EDIT OPERATION

INSTRUCTION NUMBER ? 5
```

Sample 2. Program printout showing edit process. Underlined entries indicate operator response to program questions.

```
TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
        1--PREPARE A NEW ADDRESS LIST
        2--EDIT INFORMATION IN LIST
        3--DELETE AN ADDRESSEE
        4--ADD AN ADDRESSEE TO LIST
        5--LIST ALL ADDRESSEES
        6--COPY LIST IN MEMORY TO TAPE
        7--READ ADDRESS LIST FROM TAPE
        8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 3

TYPE NUMBER ASSIGNED TO ADDRESSEE YOU WISH TO DELETE

ADDRESSEE NUMBER ? 3

3   ABLE; BILLY                     123 RANDOLPH RD.
    ATLANTA;GA.33333                400/555-5555
    06-04-70

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS:

    1--DELETE ADDRESSEE SHOWN ABOVE
    2--DELETE DIFFERENT ADDRESSEE
    3--RETURN TO MAIN PROGRAM
INSTRUCTION NUMBER? 1


TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
        1--PREPARE A NEW ADDRESS LIST
        2--EDIT INFORMATION IN LIST
        3--DELETE AN ADDRESSEE
        4--ADD AN ADDRESSEE TO LIST
        5--LIST ALL ADDRESSEES
        6--COPY LIST IN MEMORY TO TAPE
        7--READ ADDRESS LIST FROM TAPE
        8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 5

1   ABLE; FRANK R.*                 123 RANDOLPH RD.
    ATLANTA;GA.33333                400/555-5555
    03-23-45
2   ABLE; RUTH C. *                 123 RANDOLPH RD.
    ATLANTA;GA.33333                400/555-5555
    12-22-46
3   DELETED                         DELETED
    DELETED                         DELETED
    DELETED
4   BAKER; CARL F.                  PO BOX 123
    BALTIMORE;MD.21111              300/444-4444
    00-00-00

TO CONTINUE, PRESS 'RETURN' KEY
?

5   BAKER; MILDRED                  PO BOX 123
    BALTIMORE;MD.21111              300/444-4444
    09-27-55

--END OF LIST--PRESS 'RETURN' KEY
?
```

Sample 3. Example of deletion operation.

space) and five-numeral zip code. The pattern is significant because the companion address list program has been instructed to count to the left (using the LEFT$ function) to search for the name of a state. If you were to omit one of the zip code numbers or place an extra character between the state abbreviation and the zip code, you would get an erroneous output from your attempted search. Use the correct pattern (e.g., Peterborough; NH.03458), and you should experience no problem with the address line.

One final potential "booby trap" that the exercise of care can help you avoid is contained in line 550. If you do not know your addressee's birth date, enter: "00-00-00." Notice that the birthdate requires the use of eight characters (six numerals plus two dashes, or spaces). If you know your correspondent's birth month but don't know his/her birthday or birth year, fudge a bit. Guess. Type in the approximate day and year. The address list program will use the dates you enter to calculate the addressee's age. You will remember (we hope) that the age shown is only your guess.

State	Abbr.
Alabama	AL
Alaska	AK
Arizona	AZ
Arkansas	AR
California	CA
Colorado	CO
Connecticut	CT
Delaware	DE
Dist. of Colum.	DC
Florida	FL
Georgia	GA
Hawaii	HI
Idaho	ID
Illinois	IL
Indiana	IN
Iowa	IA
Kansas	KS
Kentucky	KY
Louisiana	LA
Maine	ME
Maryland	MD
Massachusetts	MA
Michigan	MI
Minnesota	MN
Mississippi	MS
Missouri	MO
Montana	MT
Nebraska	NB
Nevada	NV
New Hampshire	NH
New Jersey	NJ
New Mexico	NM
New York	NY
North Carolina	NC
North Dakota	ND
Ohio	OH
Oklahoma	OK
Oregon	OR
Pennsylvania	PA
Rhode Island	RI
South Carolina	SC
South Dakota	SD
Tennessee	TN
Texas	TX
Utah	UT
Vermont	VT
Virginia	VA
Washington	WA
West Virginia	WV
Wisconsin	WI
Wyoming	WY

Table 1. Listing of state names and abbreviations approved for address use by the U.S. Postal Service.

As long as the month of birth is known and appears as the first two digits of the eight-character birth date group, the address list program will search for and list all of your correspondents whose birthdays occur in the month you designate.

Other Program Details

Program lines 330 to 350 and 580 to 600 allow you to enter information pertaining to relatives of your correspondent into your list. All you need to do is type in the relatives' names and birth dates. The editor program refers to your principal correspondent's street address, city, state and zip code and telephone number and enters that information for you.

An asterisk placed after your correspondent's name (lines 370 to 380) is used as a "flag" to indicate that he or she is on your Christmas-card mailing list. The companion address list program searches for the asterisk placed on the name line whenever you instruct it to identify those on your Christmastime exchange list.

Of course, with appropriate address-list-program modifications, you could, if you wished, use the asterisk to indentify current, past or paid-up members of a club or to show preferred business customers.

In lines 380 and 390 you are asked to type a "9" in lieu of a name whenever you have completed making entries in your address list. The "9" signals the computer to return you to the executor (list of eight options) to review the list in memory (option 5) before you exercise the record option (6) to transfer the last block of correspondent data to your cassette tape file.

The statement "PRINT CHR$(18)" in line 1640 turns on the cassette tape motor for recording, and "PRINT CHR$(20)" turns off the motor when the record sequence has been completed. You should substitute your own motor-control commands in lines 1640 and 1786 if they differ from the ones used by the SWTP M6800/AC-30 recorder interface. Similarly, "PRINT CHR$(17)" in line 1900 commands the AC-30 to turn on the recorder for "loading" the address list into memory. "PRINT CHR$(19)" at line 2020 commands shutoff of the recorder motor.

You may not need to be reminded to prepare your tape recorder to receive the address list as it is dumped. In that case, you can remove lines 1610 to 1630. And if you feel that the reminders contained in lines 1860 to 1880 insult your intelligence, feel free to remove them also. These statements were added to the program only after we had repeatedly failed

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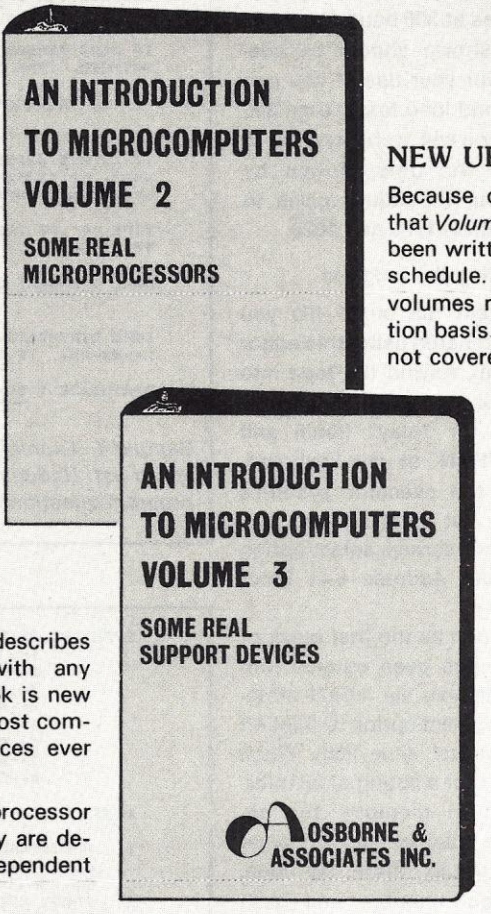

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to: set the baud rate switches to 300; check the AC-30 motor switch positions; press the recorder's control levers; and rewind the tape in the cassette.

Using INPUT Statements

The routine found between lines 1850 and 2020 allows you to load your recorded address list into the editor program for checking or updating. As you can see (lines 1930 to 1980), information is loaded into the editor program from tape using BASIC's INPUT statement. When a program sequence meets an INPUT statement, a question mark appears on the video monitor screen, and the computer waits for data to be entered—usually typed in by the operator at the system's terminal keyboard.

Not generally recognized is that data requested by an INPUT statement can be prerecorded and supplied to the computer through a tape cassette's interface port. The procedure to accomplish this is only slightly "tricky," but it works reliably once you understand and apply the principle. The secret of making an INPUT statement work to give you access to taped information files rests heavily on using properly timed FOR/NEXT loops.

The tape you prepare using the editor program will be used to provide names, addresses, phone numbers, etc., to the address list program as well as to the editor program itself (for review and revision) in response to INPUT statements. Therefore, you will have to introduce appropriate delays between elements of the address information as you record them on tape.

Line 1670 calls for a subroutine delay loop of 500 at line 1790. This rather long pause gives the tape recorder motor an opportunity to start and stabilize. It also allows the INPUT statement (during subsequent loading into the program) to present its characteristic question mark—or series of them—on the monitor's screen before file information transfers from tape to memory.

After the tape recorder has begun rolling, line 1675 calls the relatively short (70 loops) subroutine at line 1820 to separate subsequent elements of the list being recorded on the taped file. The duration of both delay loops was determined experimentally. If your system operates at 300 baud, the delay loops shown should be adequate for your use. If you can dump and load faster than 300 baud, you will probably want to adjust the delay loops by changing the values given to "E" in lines 1790 and 1820.

Executing the Program

To test the initial file you have prepared using this editor program, rewind the tape into its cassette, prepare your recorder for "play" (load) and enter "RUN" at your keyboard. When the executor system's option list appears on your monitor's screen, select option 7, "Read Address List From Tape."

As soon as the first block of names has been entered into core memory via INPUT statements, select option 5, "List All Addressees" (line 250). When you ask for a listing of all information in memory, the sequence number, name, street address, city, state, zip code, telephone number and birth date of each addressee will be presented on your video terminal. Note the sequence number that has been assigned to the individual whose data needs correction. It is *that* number you must enter in response to the INPUT statement that results from line 680.

After you have entered the correspondent's sequence number, you will be asked which element of information (name, address, phone number, etc.) you wish to edit. If you respond by typing a number "3" (line 750), the addressee's telephone number in the file will be displayed on your monitor's screen (line 1010) and you will be asked to enter the corrected phone number (lines 1030 to 1050).

The correspondent's sequence number becomes important, too, in the event you want to delete an addressee from your file (line 1170). To be certain that you delete only the intended information, the name and other data indentified by the sequence number you selected will appear on the CRT's screen (lines 1210 to 1230).

If the name that appears is the one you intended to delete, enter a "1" at your keyboard. If you made a mistake in typing the wrong addressee sequence

```
TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
        1--PREPARE A NEW ADDRESS LIST
        2--EDIT INFORMATION IN LIST
        3--DELETE AN ADDRESSEE
        4--ADD AN ADDRESSEE TO LIST
        5--LIST ALL ADDRESSEES
        6--COPY LIST IN MEMORY TO TAPE
        7--READ ADDRESS LIST FROM TAPE
        8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 4


IF NEXT PERSON TO BE LISTED LIVES WITH LAST ADDRESSEE
ENTERED, TYPE A 'Y'; OTHERWISE HIT 'RETURN' KEY

'Y' OR 'RETURN' ? Y


TYPE NAME USING THIS PATTERN: LAST NAME, FIRST
NAME, MI.(XXXXXX;XXXX X.). PLACE A '*' IMMEDIATELY
AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST

TYPE '9' IF THERE ARE NO MORE NAMES
TO BE ADDED TO YOUR LIST.

NAME ? BAKER; SUSAN L.


TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:
XX-XX-XX.  IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00

BIRTHDATE ? 09-12-77
```

Sample 4. Example of edit operation to add a name to an existing list. Underlined entries indicate operator responses to program questions.

```
TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
        1--PREPARE A NEW ADDRESS LIST
        2--EDIT INFORMATION IN LIST
        3--DELETE AN ADDRESSEE
        4--ADD AN ADDRESSEE TO LIST
        5--LIST ALL ADDRESSEES
        6--COPY LIST IN MEMORY TO TAPE
        7--READ ADDRESS LIST FROM TAPE
        8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 5

1   ABLE;FRANK R.*                  123 RANDOLPH RD.
    ATLANTA;GA.33333                400/555-5555
    03-23-45
2   ABLE; RUTH C.*                  123 RANDOLPH RD.
    ATLANTA;GA.33333                400/555-5555
    12-22-46
3   ABLE; BILLY                     123 RANDOLPH RD.
    ATLANTA;GA.33333                400/555-5555
    07-06-69
4   BAKER; CARL F.                  PO BOX 123
    BALTIMORE;MD.21111              300/444-4444
    00-00-00

TO CONTINUE, PRESS 'RETURN' KEY
?


5   BAKER; MILDRED                  PO BOX 123
    BALTIMORE;MD.21111              300/444-4444
    09-27-55
6   DELETED


7   BAKER; SUSAN L.

    09-12-77

--END OF LIST--PRESS 'RETURN' KEY
?
```

Sample 5. Example of the use of Option 5, "List All Addressees."

number or if you merely changed your mind after deletion, type a "2" (line 1280) and re-identify the name you intended to remove from your file.

Lines 1320, 1330 and 1660 perform the file deletion operation. Line 1660 causes names you wish eliminated to be bypassed by the "dump" routine. Refer to line 130 for the L$ = "Deleted" definition.

After information associated with the first four names has been presented on your monitor's screen, the program pauses to give you time to examine the displayed data. When you are ready to continue, press the "Return" or "Enter" key at your terminal, and the next four names will appear. The four-name counter appears in lines 1510 and 1550. If you wish to present fewer or more names, change line 1550 accordingly.

If Troubles Develop . . .

If your cassette tape file input ever misfires or if your modified program develops a fault that causes the editor program to jump back to BASIC, you may receive a message (line 1470), "The address list in memory contains no names," when you ask for a listing of all addressees (line 250). If the fault (error) message you receive requires you to reenter a corrected program statement, you may lose access to the block of names you had previously loaded into memory. That's no big loss if you are revising or checking a file. You can rewind the taped list and reload it. Before reloading the block of names, however, try typing "GOTO 190" and select option 5, "List All Addressees," to determine whether or not the block of names has been erased. It might still be there.

A Beginner's Program

Any professional programmer who reads this article will recognize that no part of the editor program can be classified as "sophisticated." It wasn't meant to be more than useful. The program was written for the novice, hobby programmer who wants to be able to follow a set of computer instructions from beginning to end almost as easily as his computer traces its path through the program.

If the novice makes mistakes in attempting to tailor this program to fit his own system's requirements, he need not worry. Errors should not be difficult to spot and eliminate since the runs shown in Samples 1 to 5 illustrate how the presentation should appear.

In writing program instructions to assist the novice to prepare and edit information in his address list, we have taken pains to guide his every entry. Perhaps we've overdone it—particularly in lines 360 to 400. For a machine running at 300 baud or less, waiting for the name INPUT question mark can seem like an eternity. Once the operator becomes familiar with the program—particularly with the required format of entries—the instruction wording can be reduced to cut the "dead" time during preparation of the original address list file.

Because the editor program is quite long, we have eliminated the usual "careless operator" safeguards. If, for example, you respond to line 290 with a number above eight, the program will jump back to BASIC and produce an error message. Or, if you use a comma between surnames and given names (instead of using a semicolon), no warning statement will be flashed on the screen suggesting that the correct punctuation be used.

If such reminders are wanted—and memory capacity is available to accommodate them—they can be introduced by the programmer.

We think that the novice programmer will find that the editor and address list programs work well together. Admittedly, at 300 baud (the Kansas City cassette recorder speed standard), the loading of information into memory is slow. But the search that follows entry of the data is fast.

There is one positive thing that you can say for creating computer-controlled files by recording data on tape in serial (one character at a time) form: It makes you yearn to get your hands on a floppy disk. ■

Program listing.

```
0010 REM ADDRESS EDITOR PROGRAM
0020 REM PREPARED BY B. BATEMAN AND S. WANTZ
0030 REM PROGRAM LENGTH: 6.5K BYTES
0040 REM PROGRAM RUNS IN SWTPC 8K BASIC VERSION 2.0
0050 PRINT CHR$(16),CHR$(22):PRINT:PRINT
0100 PRINT TAB(10);"ADDRESS EDITOR PROGRAM"
0110 LINE= 0
0120  I=0:U$="9"
0130  L$="DELETED": PRINT:PRINT
0140 PRINT "TYPE THE NUMBER OF NAMES YOU WANT TO READ"
0150 PRINT "FROM TAPE--OR RECORD ON TAPE--AT ONE TIME."
0160 PRINT : INPUT "HOW MANY NAMES ",R
0170  R1=R+INT(0.2*R)+2
0180 DIM N$(R1),A$(R1),C$(R1),P$(R1),B$(R1)
0190 PRINT :PRINT CHR$(16),CHR$(22):A=0
0200 PRINT "TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:"
0210 PRINT TAB(10);"1--PREPARE A NEW ADDRESS LIST"
0220 PRINT TAB(10);"2--EDIT INFORMATION IN LIST"
0230 PRINT TAB(10);"3--DELETE AN ADDRESSEE"
0240 PRINT TAB(10);"4--ADD AN ADDRESSEE TO LIST"
0250 PRINT TAB(10);"5--LIST ALL ADDRESSEES"
0260 PRINT TAB(10);"6--COPY LIST IN MEMORY TO TAPE"
0270 PRINT TAB(10);"7--READ ADDRESS LIST FROM TAPE"
0280 PRINT TAB(10);"8--EXIT FROM EDITOR PROGRAM"
0290 PRINT :INPUT "INSTRUCTION ",T
0300 ON T GOTO 310,660,1160,1360,1450,1600,1850,9999
0310 FOR I=1 TO R: IF I=1 THEN 360
0320 PRINT :PRINT CHR$(16),CHR$(22)
0330 PRINT "IF NEXT PERSON TO BE LISTED LIVES WITH LAST ADDRESSEE"
0340 PRINT "ENTERED, TYPE A 'Y'; OTHERWISE HIT 'RETURN' KEY"
0350 PRINT :INPUT "'Y' OR 'RETURN' ",Y$
0360 PRINT :PRINT CHR$(16),CHR$(22)
0365 PRINT "TYPE NAME USING THIS PATTERN: LAST NAME, FIRST"
0370 PRINT "NAME, MI.(XXXXXX:XXXX X.). PLACE A '*' IMMEDIATELY"
0375 PRINT "AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST"
0380 PRINT :PRINT"TYPE '9' IF THERE ARE NO MORE NAMES"
0390 PRINT "TO BE ADDED TO YOUR LIST."
0400 PRINT :INPUT "NAME ",N$(I)
0410 IF N$(I)=U$ THEN 190
0420 IF Y$="Y" THEN 580
0425 PRINT :PRINT CHR$(16):CHR$(22)
0430 PRINT "TYPE STREET ADDRESS--PATTERN NOT IMPORTANT"
0440 PRINT :INPUT "STREET ADDRESS ",A$(I)
0450 PRINT :PRINTCHR$(16),CHR$(22)
0460 PRINT "TYPE CITY; STATE AND ZIP CODE"
0470 PRINT "USING THIS PATTERN: XXXXX;XX.XXXXX"
0480 PRINT :INPUT "CITY;STATE AND ZIP CODE ",C$(I)
0490 PRINT :PRINT CHR$(16),CHR$(22)
0500 PRINT "TYPE PHONE NUMBER--PATTERN NOT IMPORTANT"
0510 PRINT "IF PHONE NUMBER IS NOT KNOWN, HIT 'RETURN' KEY"
0520 PRINT : INPUT "PHONE NUMBER ",P$(I)
0530 PRINT : PRINT CHR$(16),CHR$(22)
0540 PRINT "TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:"
0550 PRINT "XX-XX-XX.  IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00"
0560 PRINT : INPUT "BIRTHDATE ",B$(I)
0565 IF A=1 THEN 190
0570 NEXT I
0575 GOTO 1400
```

```
0580  A$(I)=A$(I-1)
0590  C$(I)=C$(I-1)
0600  P$(I)=P$(I-1)
0610 GOTO 530
0660 PRINT :PRINT CHR$(16),CHR$(22)
0670 PRINT "WHICH ADDRESSEE NUMBER IN YOUR LIST DO YOU WISH TO EDIT?"
0680 PRINT :INPUT "ADDRESSEE LIST NUMBER ",O
0690 PRINT :PRINT CHR$(16);CHR$(22)
0700 PRINT "TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS"
0710 PRINT "TO INDICATE THE ELEMENT YOU WISH TO EDIT:"
0720 PRINT :PRINT
0730 PRINT "1--NAME OR XMAS CARD LIST CODE"
0740 PRINT "2--ADDRESS"
0750 PRINT "3--PHONE NUMBER"
0760 PRINT "4--BIRTHDATE"
0770 PRINT "5--END EDIT OPERATION"
0780 PRINT : INPUT "INSTRUCTION NUMBER ",Q
0790 ON Q GOTO 800,890,1000,1080,190
0800 PRINT :PRINT CHR$(16),CHR$(22);PRINT N$(O)
0810 PRINT "TYPE NAME USING PATTERN: XXXXX;XXXXX X.": PRINT
0820 PRINT "IF PERSON NAMED IS ON YOUR XMAS CARD MAILING"
0830 PRINT "LIST, ADD '*' IMMEDIATELY AFTER THE NAME.":PRINT
0840 PRINT : INPUT "NAME ",N$(O)
0850 PRINT :PRINT CHR$(16),CHR$(22)
0860 GOTO 660
0890 PRINT :PRINT CHR$(16);CHR$(22);PRINT A$(O):PRINT
0900 PRINT "TYPE NEW STREET ADDRESS"
0910 PRINT :INPUT "STREET ADDRESS ",A$(O)
0920 PRINT
0930 PRINT C$(O)
0940 PRINT
0950 PRINT "TYPE CITY; STATE. AND ZIP CODE USING"
0960 PRINT "THIS PATTERN: XXXXXX;XX.XXXXX":PRINT
0970 PRINT :INPUT "CITY; STATE AND ZIP CODE ",C$(O)
0990 GOTO 660
1000 PRINT :PRINT CHR$(16),CHR$(22)
1010 PRINT P$(O)
1020 PRINT
1030 PRINT "TYPE NEW PHONE NUMBER--PATTERN NOT IMPORTANT":PRINT
1040 PRINT "IF PHONE NUMBER IS UNKNOWN, HIT 'RETURN' KEY":PRINT
1050 PRINT : INPUT"PHONE NUMBER ",P$(O)
1070 GOTO 660
1080 PRINT :PRINT CHR$(16),CHR$(22)
1090 PRINT B$(O)
1100 PRINT
1110 PRINT "TYPE BIRTHDATE.  USE MONTH-DAY-YEAR"
1120 PRINT "PATTERN: XX-XX-XX": PRINT
1130 PRINT : INPUT "BIRTHDATE ",B$(O)
1150 GOTO 660
1160 PRINT :PRINT CHR$(16),CHR$(22)
1170 PRINT "TYPE NUMBER ASSIGNED TO ADDRESSEE YOU WISH TO DELETE"
1180 PRINT
1190 PRINT : INPUT "ADDRESSEE NUMBER ",M
1200 PRINT :PRINT CHR$(16),CHR$(22)
1210 PRINT M;TAB(5);N$(M);TAB(35);A$(M)
1220 PRINT TAB(5);C$(M);TAB(35);P$(M)
1230 PRINT TAB(5);B$(M)
1240 PRINT
1250 PRINT "TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS:"
1260 PRINT
1270 PRINT TAB(5);"1--DELETE ADDRESSEE SHOWN ABOVE"
1280 PRINT TAB(5);"2--DELETE DIFFERENT ADDRESSEE"
1290 PRINT TAB(5);"3--RETURN TO MAIN PROGRAM"
1300 PRINT "INSTRUCTION NUMBER";:INPUT V
1310 ON V GOTO 1320,1160,190
1320  N$(M)=L$:A$(M)=L$:C$(M)=L$
1330  P$(M)=L$:B$(M)=L$
1340 PRINT :PRINT CHR$(16),CHR$(22)
1350 GOTO 190
1360 PRINT :PRINT CHR$(16),CHR$(22)
1365 IF N$(I)=U$ THEN GOSUB 2030
1370  A=1:I=I+1
1380 IF I>R1 THEN I=I-1: GOTO1400
1390 GOTO 330
1400 PRINT :PRINT CHR$(16),CHR$(22)
1410 PRINT "TIME TO TRANSFER THIS BLOCK OF NAMES"
1420 PRINT "FROM MEMORY TO TAPE BEFORE ADDING ANOTHER NAME"
1430 PRINT :INPUT "TO CONTINUE, PRESS 'RETURN' KEY",H$
1440 GOTO 190
1450  K=0: PRINT CHR$(16):CHR$(22)
1460 IF I<>0 THEN 1500
1470 PRINT "THE ADDRESS LIST IN MEMORY CONTAINS NO NAMES"
1480 PRINT :PRINT"TO CONTINUE, PRESS 'RETURN' KEY":INPUT H$
1490 GOTO 190
1500 FOR J=1 TO I
1510  K=K+1
1520 PRINT J;TAB(5);N$(J);TAB(35);A$(J)
1530 PRINT TAB(5);C$(J);TAB(35);P$(J)
1540 PRINT TAB(5); B$(J)
1550 IF K<4 THEN 1570
1560  K=0:PRINT:PRINT"TO CONTINUE, PRESS 'RETURN' KEY"
1565 INPUT H$: PRINT:PRINT CHR$(16),CHR$(22)
1570 NEXT J
1580 PRINT :PRINT"--END OF LIST--PRESS 'RETURN' KEY":INPUT H$
1590 GOTO 190
1600 PRINT :PRINT CHR$(16),CHR$(22):A1=0
1601 PRINT "IS THIS THE LAST GROUP OF NAMES TO BE"
1602 PRINT "ADDED TO THE LIST--YES OR NO?"
1603 INPUT H$:IF H$="YES" THEN A1=1
1610 PRINT "CHECK BAUD RATE CONTROLS, TAPE AND RECORDER"
1620 PRINT "CONTROLS.":PRINT:PRINT
1630 PRINT "WHEN YOU ARE READY TO RECORD, HIT 'RETURN' KEY"
1640 INPUT H$: PRINT CHR$(18)
1650 FOR J=1 TO I
1660 IF N$(J)=L$ THEN 1780
1670 IF J=1 GOSUB 1790
1675 IF J>1 GOSUB 1820
1680 PRINT N$(J)
1690 GOSUB 1820
1700 PRINT A$(J)
1710 GOSUB 1820
1720 PRINT C$(J)
1730 GOSUB 1820
1740 PRINT P$(J)
1750 GOSUB 1820
1760 PRINT B$(J)
1780 NEXT J
1785 IF A1=1 THEN GOSUB 1790:PRINT U$
1786 PRINT CHR$(20):GOTO 190
1790 FOR E=1 TO 500
1800 NEXT E
1810 RETURN
1820 FOR E=1 TO 70
1830 NEXT E
1840 RETURN
1850 PRINT :PRINT CHR$(16),CHR$(22):I=0
1860 PRINT "PREPARE RECORDER FOR PLAYBACK OF ADDRESS LIST TAPE"
1870 PRINT :PRINT "----SET BAUD RATE SWITCHES----"
1880 PRINT :PRINT"WHEN ALL IS READY, PRESS 'RETURN' KEY"
1890 INPUT H$
1900 PRINT CHR$(17)
1910 FOR I=1 TO R
1920 PRINT I
1930 INPUT N$(I)
1940 IF N$(I) = U$ THEN I=I-1:GOTO 2020
1950 INPUT A$(I)
1960 INPUT C$(I)
1970 INPUT P$(I)
1980 INPUT B$(I)
2000 NEXT I
2020 PRINT CHR$(19):GOTO 190
2030  N$(I)=L$
2040 RETURN
9999 END
```

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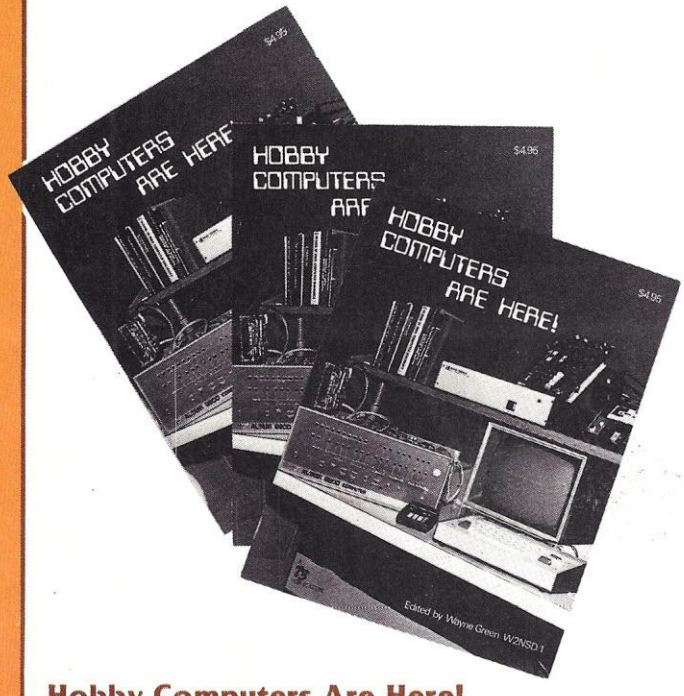

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✓ Reader Service—see page 147

Don Ketchum
313 Van Ness Ave.
Upland CA 91786

Display Your PET!

Watch your CRT as all 316 PET characters appear on the screen.

Believe it or not, the PET 2001 computer has 316 different characters that can be displayed on the screen. Any one of these characters can be displayed at any one of 1000 positions on the screen (25 rows and 40 positions per row).

Each display position has its own unique memory address. In decimal notation these addresses run from 32768 to 33767. Each character is represented by a different combination of bits stored at the particular memory position chosen.

The POKE statement can be used to store a particular bit combination at any desired memory location. For example, to store an A in the middle of the screen, key in POKE 33268,1, which stores binary 00000001 at the memory position with decimal address 33268. Try another example: POKE 33038, 38, which stores decimal 38 (binary 00100110) at decimal address 33038. This displays "&" above and to the right of the middle of the screen.

One byte (8 bits) can only give 256 different combinations, leading one to believe that we have only 256 different characters available. We can change 60 of the characters by storing either one of two numbers at the memory position with decimal address 59468. POKE 59468,12 gives the normal characters (those shown on the keyboard), and POKE 59468,14 changes 60 of the characters to new characters, including the 26 lowercase letters.

This simple program gives a good demonstration of these ideas. It first blanks out all 1000 display positions and then displays 256 characters. It then changes 60 of these characters back and forth every second or two.■

```
10 FOR A = 32768 TO 33767
20 POKE A, 32
30 NEXT A
40 B = 32768
50 C = 0
60 FOR A = 0 TO 255
70 C = C + 1
80 POKE B + 2•A,A
90 IF C = 20 THEN C = 0: B = B + 40
100 NEXT A
110 POKE 59468,14
120 FOR A = 1 TO 1000
130 NEXT A
140 POKE 59468,12
150 FOR A = 1 TO 1000
160 NEXT A
170 GOTO 110
```

Program listing.

✓ *Reader Service—see page 147*

Frank B. Rowlett, Jr.
300 Apperson Dr.
Blacksburg VA 24060

TRS-80 Tape Controller

Life holds enough hassles without your having to constantly connect and disconnect recorder plugs. Build this piece of equipment and you can leave 'em permanently plugged in.

After using my Radio Shack TRS-80 microcomputer system for a while, I became tired of connecting and disconnecting the plugs to the tape recorder every time I used it. If I wanted to rewind or fast-forward the cassette, I had to disconnect the REMOTE plug. The instructions for using the tape recorder with the TRS-80 computer direct the operator to disconnect the plug not being used when either reading or writing tape.

Therefore, to write from the computer to the recorder I had to connect the AUX plug and disconnect the EAR plug; to read from the recorder to the computer I had to connect the EAR plug and disconnect the AUX plug. This can lead to confusion as to which plug is which, and more than once I lost some data because of this. So I decided to do something about it.

I no longer have to connect or disconnect plugs when I use the recorder with the TRS-80—a black box I built handles all that for me. All I have to do now is set switches. This saves time and frustration and cuts down on errors. I call this black box the TRS-80 Tape Controller.

Components

All components for the black box can be obtained from any Radio Shack store. Of course, they can be obtained elsewhere, but a nearby Radio Shack store is a convenient source for the components. Besides, it seems appropriate to build an attachment for a TRS-80 computer with Radio Shack parts.

If you want to put together a TRS-80 Tape Controller you don't need any special skills (I frequently solder one finger to another). You just need a sharp knife; a drill; drill bits of 1/2, 3/8, 9/32, 1/4, 5/32 and 1/8 inches; a soldering iron; a pair of long-nose pliers; and something to check circuit continuity. A wire stripper, a pair of diagonal cutters and a spare 1/8 inch miniature phone plug are helpful, but not necessary.

The components needed are shown in Fig. 1. The only other things needed are solder and some 22-gauge stranded wire (and rub-on letters and some transparent tape if you want to do a pretty lettering job on the box—or use the labels provided if convenient).

Remote-Control Circuit Assembly

Start by taking the cover off the metal cabinet and putting it, along with the screws and washers, where it won't get lost. Next, using a ruler, carefully locate the centers for the holes to be drilled in the front and back of the bottom part of the cabinet (see Fig. 2). Now carefully drill the right-sized holes (as indicated in Fig. 2) at each of the centers and deburr the holes.

Mount the double-pole, double-throw (center off) toggle switch (called the toggle switch from now on) in the 1/2 inch hole and the single-pole, single-throw (normally open) miniature momentary push-button switch (called the momentary switch from now on) in the 9/32 inch hole on the front of the cabinet. Mount the two-conductor 3/32 inch subminiature phone jack (normally closed) in the top middle 5/32 inch hole in the back of the cabinet. Tighten their mounting nuts just enough to keep them from falling out; you'll tighten them later after all the wires are connected to them.

Cut the six foot, 1/8 inch min-

TRS-80 Tape Controller with a standard Radio Shack TRS-80 microcomputer system. (Photos by Marian Early)

Quantity Needed	Component Number on Schematic	Description	Radio Shack Part Number (# in ( ) is minimum sold)
1	--	Metal cabinet, 3 1/4" x 2 3/16" x 4"	270-251 (1)
1	--	Hexagon instrumentation knob with white line mark for 1/4" shaft, 1 3/8" wide by 5/8" deep	274-407 (2)
1	P1	2-conductor 3/32" sub-miniature phone plug (black)	274-289 (2)
1	P2 and P3	72" cord, 1/8" miniature phone plug to 1/8" miniature phone plug	42-2420 (1)
1	J1	2-conductor 3/32" sub-miniature phone jack, closed circuit	274-292 (2)
2	J2 and J3	Enclosed 1/8" miniature phone jacks, closed circuit (open circuit will also work here)	274-296 or 274-297 (2)
1	S1	Toggle switch, heavy-duty DPDT with neutral center red handle	275-653 (1)
1	S2	Push-button switch, SPST miniature momentary contact, normally open	275-1547 (5)
1	S3	Rotary switch, 4-pole, 2-position, 2" shaft 1/4" diameter	275-1384 (1)

Fig. 1. Components needed to build the TRS-80 Tape Controller.

iature phone plug to 1/8 inch miniature phone plug cord into three two-foot pieces. This gives you two pieces of cord each with a phone plug on one end and one piece with nothing on either end. Use a sharp knife to cut around the outer jacket 1/2 inch back from all the cut ends of the cords and remove the outer jacket insulation. Carefully peel back the copper shielding around the center wire insulation and twist the shielding into a lead on each of the cut ends of the cords. Remove about 1/4 inch of insulation from the center wire of the cut ends of the cords. This gives you two leads on each cut end of the cords to solder to the components as required later.

Run one end of the center piece of cord whose ends you prepared through the bottom middle 5/32 inch hole in the back of the cabinet (it should be a tight fit). Now, using 22-gauge stranded wire, connect and solder all connections indicated in the schematic in Fig. 3.

Check out the circuits using your device to check continuity of circuits. If the toggle switch is set to control the computer but there is no plug in the jack, the two ends of the cord out the back of the cabinet should complete a circuit. When the toggle switch is set to off, the circuit should be open with or without a plug in the jack. The circuit should be closed when the toggle switch is in any position and the momentary switch is pushed.

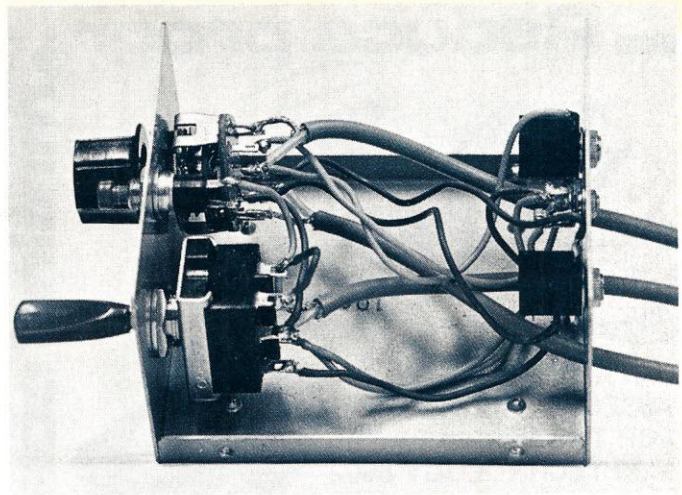
Set the toggle switch so that the computer controls the recorder. With the plug in the jack, the circuit should be open. Now short the connections on the plug and the circuit should be closed.

Set the toggle switch on manual control and the circuit should be closed. If it is, and if all these tests worked as described, the remote-control circuits are finished. If any of the tests failed, check your wiring against the schematic in Fig. 3, correct the error(s) and try the tests again.

Take the body of the 3/32 inch subminiature plug and slide it on the cord from the back of the cabinet so it can be screwed on the plug when it's soldered to the cord. Solder the 3/32 inch subminiature plug on the end of the cord and perform your circuit tests again to be sure there are no shorts.

If it all checks out, tighten the tabs from the plug around the cord and screw the body of the plug onto the plug. Now tighten all the mounting nuts holding the switches and the jack to the cabinet. You might want to check your circuits again to be sure nothing happened when you tightened everything up.

Now you have your remote-control problem solved. If you want the computer to control the recorder, set the toggle switch to computer control, and the TRS-80 will open and close the circuit. If you want to control the recorder yourself, set the toggle switch to manual control and you can work the recorder with its keys. If you just want to control the recorder for a moment (maybe for a quick rewind), press the momentary switch and the recorder is controlled by its keys as long as the momentary switch is pressed.



Close-up of the insides of the TRS-80 Tape Controller.

Read-and-Write Circuit Assembly

Now you are ready to wire up the read and write circuits. First, cut the shaft of the four-pole, two-position rotary switch (called the rotary switch from now on) to about 1/2 inch from the end of the mounting sleeve. Insert the two cut ends of the cords with the 1/8 inch miniature plugs on them in the two bottom 5/32 inch holes on the back of the cabinet (the fit should be tight). Mount the en-

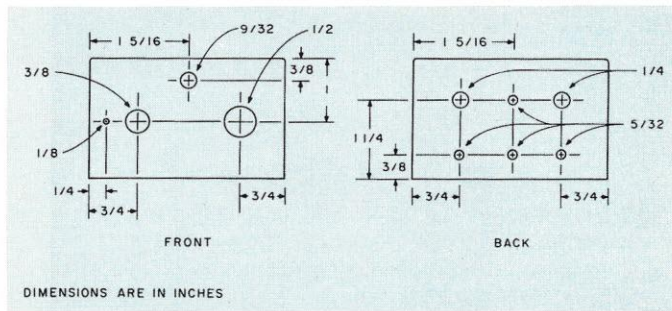


Fig. 2. Front and back of the cabinet showing the centers and the size of the holes to drill for mounting the components.

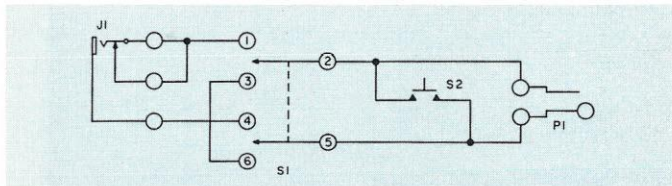


Fig. 3. Schematic of the remote control circuit (the terminal numbers on S1 refer to the terminal numbers on the Radio Shack DPDT center-off toggle switch).

Close-up of the front of the TRS-80 Tape Controller showing the labels.

closed 1/8 inch miniature phone jacks in the two top 1/4 inch holes in the back of the cabinet. Tighten the nuts on them just enough to keep them from falling out.

Now you are ready to connect (using 22-gauge stranded wire) and solder the connections as indicated in the schematic in Fig. 4. When you connect the leads from the cords into the back of the cabinet be sure that the circuit from the top jack goes to the cord immediately under it. This keeps the plugs and jacks in the back of the cabinet symmetrical and saves having to remember which plug goes to which jack.

Check out the circuits (a spare 1/8 inch miniature plug will be handy here). Set the rotary switch to one position (you can decide later which you want to be the *read* and which the *write* position) and perform the following tests.

Check to see if the tip of the plug closes the circuit to the tip of the plug inserted in the jack above it. If the circuit is not closed, then do the same test on the other jack and plug. That circuit should be closed.

If the circuit is closed, check the upper part of the plug above the tip (on the other side of the insulator) to see if it closes the circuit to the corresponding portion of the plug inserted into the jack. If it does, then test that plug and jack against the other plug and jack to be sure the circuits are open between them and there are no short circuits.

Set the rotary switch at its other position and perform the same tests. The opposite plug and jack should have a closed set of circuits; the first plug and jack should have an open set of circuits. If any of the circuits do not check out, check your connections against the schematic in Fig. 4 and correct the error(s).

When the circuits all check out mount the rotary switch in the 3/8 inch hole in the front of the cabinet (make sure the little metal tab projecting from the

Computer
Manual
Off
Read
Write
Momentary Manual
TRS-80 Tape Controller

TRS-80 Tape Controller labels (can be used in lieu of rub-ons).

✓ Reader Service—see page 147

front of the rotary switch goes into the 1/8 inch hole). Put the mounting nut over the rotary switch shaft and tighten it and the other mounting nuts on the jacks. Mount the knob on the shaft of the rotary switch and tighten the set screw when you have lined up the white indicator line where you want it.

Pick which set of plugs and jacks you want for read and which for write and indicate your choices on the back of the cabinet and on the front at the indicator on the knob. Put the top of the cabinet back on and screw it in place with the screws and washers you put away earlier. You now have a black box that is your TRS-80 Tape Controller.

Connect the tape controller between your TRS-80 computer and tape recorder by connecting the plugs from the computer to the appropriate jacks in the back of the tape controller and the plugs out the back of the tape controller to the appropriate jacks on the tape recorder.

When you want the computer to write to tape, set the rotary switch to write and the toggle switch to allow the recorder to be controlled by the computer. When you want to read from tape to the computer, set the rotary switch to read and the toggle switch to allow the computer to control the recorder. Use the toggle switch or the momentary switch to control the recorder by its keys. Use the center off position of the toggle switch to shut off all control of the tape recorder (except by the momentary switch).

Final Touches

If you want fancy lettering on your tape controller, get some small rub-on letters (most business supply and stationery stores carry a selection of them). Select the sizes that will fit neatly on your tape controller without taking up too much space, but yet, will be easy to read.

Get a clean piece of glass and carefully pull out a long piece of transparent tape and put it, sticky side down, on the glass. Be careful not to get any fingerprints on the sticky surface of the tape.

Using a ball-point pen, carefully rub the letters onto the tape to spell out the labels you need. When the labels are done, press a second piece of tape (sticky side down) over them. Use a sharp knife and a straightedge to cut around the edges of the labels and remove the excess tape.

Pick up each label with the point of a sharp knife and position it lightly where you want it on the cabinet. Move the label around until it is positioned exactly where you want it and then press down hard on it. It will now stay in that position.

When you're done, you will have a professional looking piece of equipment. It will look at home sitting next to your TRS-80 microcomputer system, and it will serve a useful function by allowing you to control the tape recorder easily without connecting and disconnecting plugs.■

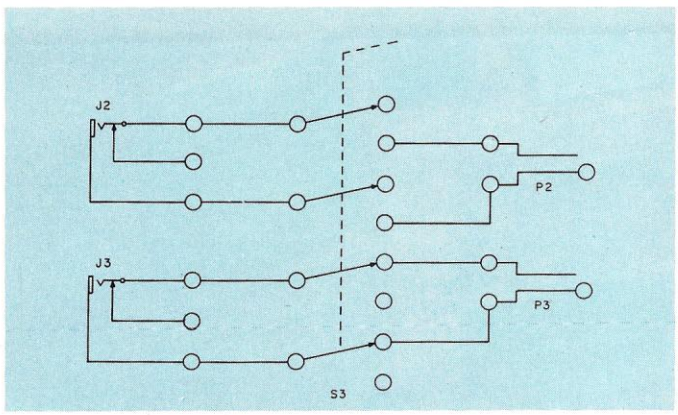


Fig. 4. Schematic of the read and write circuits.

Reader Service—see page 147

SHHH . . . People Are Sleeping

Maybe noisy and expensive Teletype machines turn you off. This thermal printer from Telpar can serve as a quiet (and economical) replacement.

Charles R. Carpenter
Consultant Resources Co.
2228 Montclair Pl.
Carrollton TX 75006

Layout shot of complete system: KIM-1 in redwood enclosure and KIM-2, 4K memory; ACT-1 TTY type TVT with monitor; tape recorders; PS-40 printer; computerist power supply—modified.

Printing the programs I am writing using my KIM-1 has become quite desirable (at least from my viewpoint). Longer programs have resulted as my skills have increased—growing to over 70 lines in Tiny BASIC and even longer in 6502 assembly language.

Checking widely separated timing loops and counting chains is difficult when you're using only a TV display (very handy for writing and editing though—no waste paper). Writing long programs by hand isn't always practical either. I've committed myself to hobby computing and have some longer-range, work-related interests. At this point I was convinced I needed a printer.

I had been checking printer ads in all the hobby magazines for some time, but the information I found was either conflicting, confusing or otherwise uninformative. I could not tell whether the various printers would work with my KIM-1. The ads either contained nothing about the interface connections or addressed themselves to RS-232C and parallel connections. KIM-1 has a serial, Teletype-oriented interface, and I had no desire to build something that *might* make a printer usable in my system.

Mid June brought the National Computer Conference (and me) to nearby Dallas. While checking out the personal computing exhibits, a display by Telpar, Inc., caught my eye. The Telpar PS-40 printer was being demonstrated, and it was printing with only a keyboard connected to it. (The significance of this did not occur to me until later.)

I picked up the data sheet and went on my way. When I looked at the sheet, I saw that the basic printing speed was 110 baud—Teletype speed. The data also indicated serial input. It seemed to be just what I wanted; now I was at least interested enough to learn more. A couple of days later I called the company and I talked to Rick Ables, vice-president of

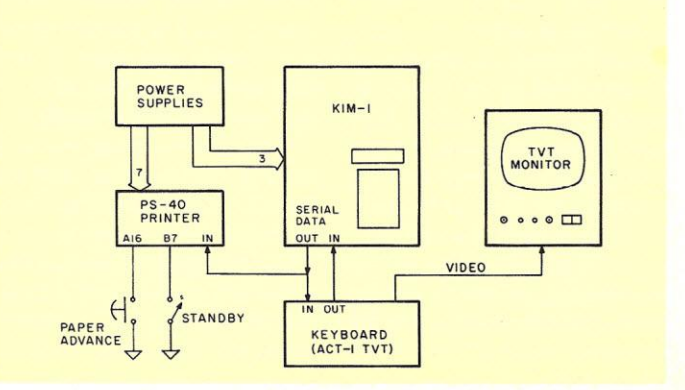


Fig. 1. Serial receive-only block diagram.

Function	Pinnumber To	From
Serial input (active low)	B-6	*KIM-1 (A-U)
Serial ground	B-20	KIM-1 (A-1)
Standby switch	B-7	B-5
Paper advance (momentary)	A-16	B-5
Jumper	A-5	A-7
Jumper	A-6	A-15
Jumper	A-15	B-15
Jumper	A-8	A-13
+18 V	B-12	Supply
Gnd	B-5	
+16 V	B-23	
Gnd	A-23	
+12 V	A-28	
+5 V	A-21	
Gnd	B-20	Supply

*1k pull-up resistor required from KIM-1 pins (A-U) to (A-S)
Note: Transpose numbers from the numbered pins to the adjacent pins on the lettered side.

Table 1.

engineering. Here's what I learned.

PS-40 Capabilities

Telpar's PS-40-3C-1 can do more than just print. For instance:

- PS-40 can be a complete Teletype replacement.
- Connected for serial receive (the way I use it), it will print whatever valid serial data output it receives from my KIM-1.
- Connected to an ASCII keyboard, the PS-40 can be the sole I/O for most of the popular microcomputers.
- Connected to a KIM-1 command generator, it will print assembly-language programs (uses the KIM-1 keyboard mainly, but makes KIM think it's connected to a Teletype).

More about the PS-40 applications—other than serial receive—later. The system, as I have assembled and am using it, is illustrated in Fig. 1.

Making the Connections

Operating the printer requires connection to a power supply: the serial data output from KIM-1 (requires a pull-up resistor) and some jumpers on the 56-pin edge connector supplied with the printer for the PS-40 circuit board. Make all connections on the 56-pin edge connector first (before you connect it to the printer). After these connections are completed, check everything carefully (have someone else check it, too, if possible). Then install the edge connector on the PS-40 circuit board. Make sure the numbered side is up. All this caution will eliminate a return trip to Telpar for repairs. The connections to the 56-pin edge connector for serial receive mode at 110 baud are shown in Table 1. Fig. 2 is a pictorial of the pin connections.

Power supplies for the PS-40 can be obtained locally and modified, if needed, to supply the required voltages. Telpar has a supply available (including −12 V if RS-232C connections are used). Those of you having a more adventurous nature may want to build your own power supply. Schematics (Figs. 3 and 4) of the Telpar power-supply circuits and a suggested power-supply circuit are included for reference.

Be sure your power source can supply peak power for the printer with adequate regulation. During carriage return, the printer motors (18 V) take peak current for more than a second, and during printing, the print head (16 V) hits its peak requirements for each character printed. Power-supply requirements for each output are shown in Table 2.

Print-head voltage is critical and requires close control. It cannot exceed 16 V, but can drop a maximum of 1 V during peak current. Voltages exceeding 16 V are likely to damage the print head. A final word of caution: If the power supply you use won't deliver

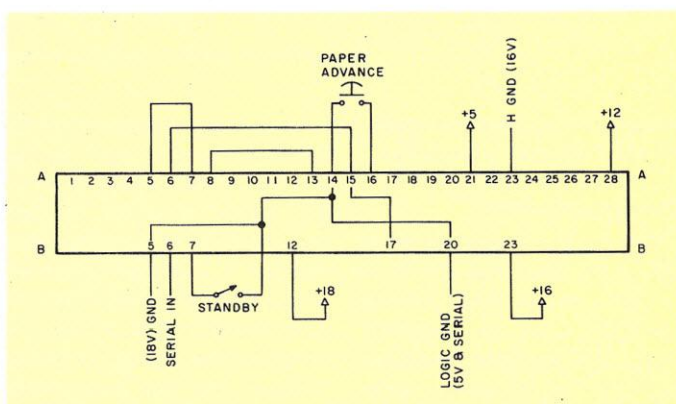


Fig. 2. PS-40 connector, serial receive-input and power connections.

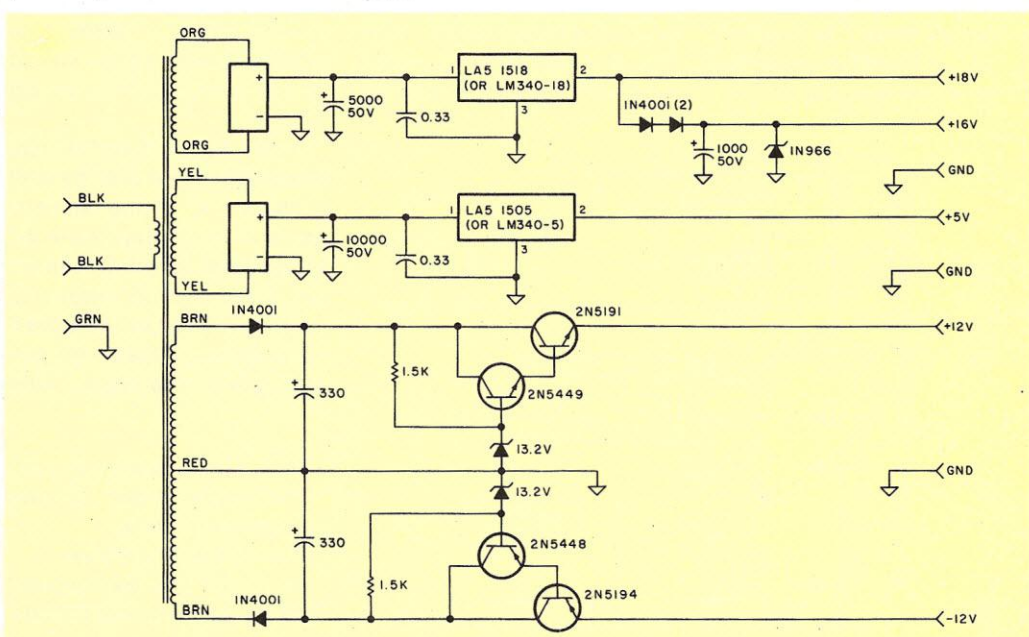
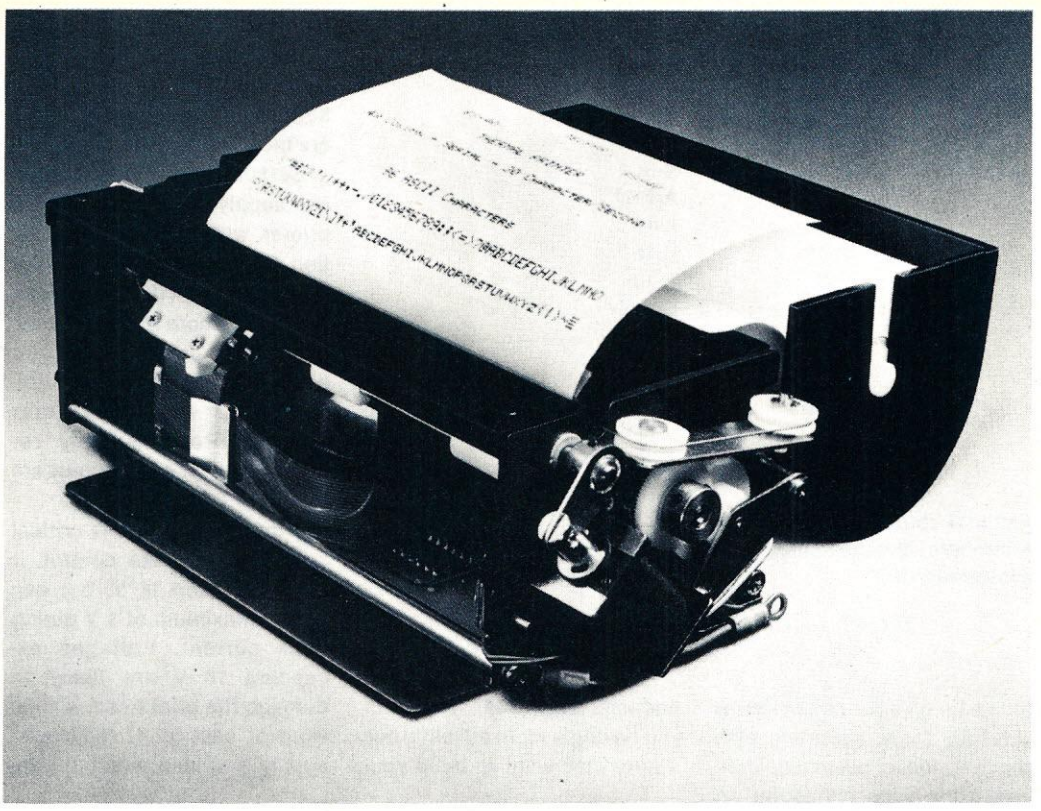


Fig. 3. PS-40 power-supply schematic.



Telpar PS-40 printer and character set.

enough power, the printer probably won't function properly.

Checking Operations

Now that all the connections are made and everything is ready, system and printer operation can be checked. First, turn on your computer and any other system components and verify normal operation. Turn on power to the printer (standby switch at run). A carriage return and line feed are the correct first responses of the printer at power on.

Load a roll of special thermal paper (be sure to order some) into the printer before proceeding further. Printing without paper behind the print head can damage it. There are right and wrong sides of the paper, so be sure to start it right. A diagram on the printer shows the paper feeding into the paper-drive mechanism from the bottom of the roll. Start a trimmed edge of paper into the printer and press the paper-feed switch. Continuous paper advance occurs when this connection is made, allowing paper to feed automatically through the printer. Now make some entries from the keyboard and check printer response. All the characters (and back-space arrow) in Example 1 are possible.

If a framing error (a series of vertical lines) occurs, check the polarity of the output signal. The jumpers are wired for an active low (negative-going) signal. This is the output signal polarity from KIM-1. An active high (positive-going) signal should be connected directly to pin A-7.

If the printer does not run, disconnect power and check all connections. If the standby switch is in standby, or pin B-7 is grounded, the printer will not run. Disconnect the edge connector and measure the unloaded voltages. If these are correct, turn off the supply. After the supplies have discharged, reconnect the edge connector and make another voltage measurement. Anything out of order means a short circuit or excessive load. Recheck overall system operation again. More than likely some little thing was inadvertently overlooked.

Some other features of the PS-40 can be examined, now that everything is working OK. My TVT keyboard has a capital-letters-lock key, and when I released it, I found the PS-40 would print small caps in a 5 × 5 dot matrix. (It prints large caps in a 5 × 7 dot matrix.) The lowercase output emerges as uppercase on my TVT but prints as small caps on the PS-40. Tiny BASIC, my present interpreter, does not recognize the lowercase outputs as commands or statements, but for REM and PRINT commands, any valid data inside the quotes will print. Example 2 shows what I mean. Typing a line longer than 48 characters is no problem either (see Example 3).

As you can see, a form of text editing and word processing is possible with the PS-40. I have used it as a pseudo-typewriter also. A final note on operating the PS-40: It really is quiet. I worked mostly early mornings and late evenings preparing this article, and was able to do all the testing and printing

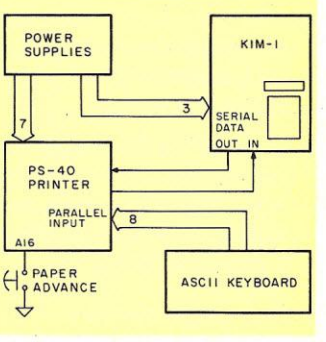


Fig. 5. Teletype replacement block diagram.

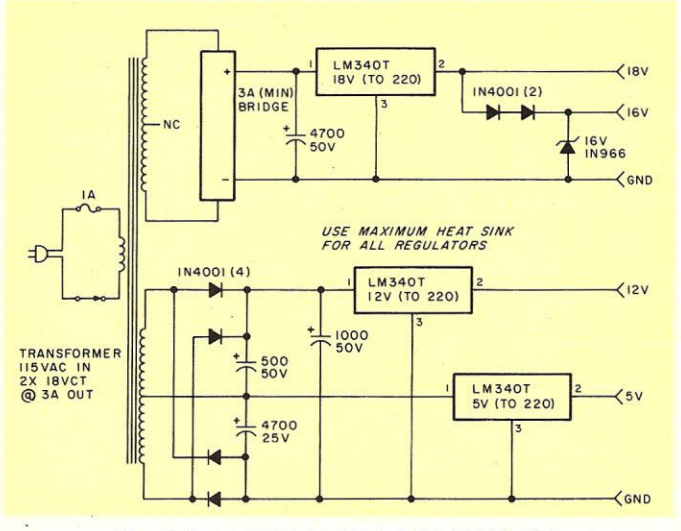


Fig. 4. Suggested power-supply schematic.

+18 V—1.5 Amp max @ less than 50 percent duty cycle.
+16 V—2.5 Amp peak for 2 μs dropping to 1.25 Amp for 6 μs @ 35 percent duty cycle.
+5 V—0.6 Amp continuous.
+12 V—0.1 Amp continuous.
−12 V—0.05 Amp continuous (RS-232C only).

Table 2.

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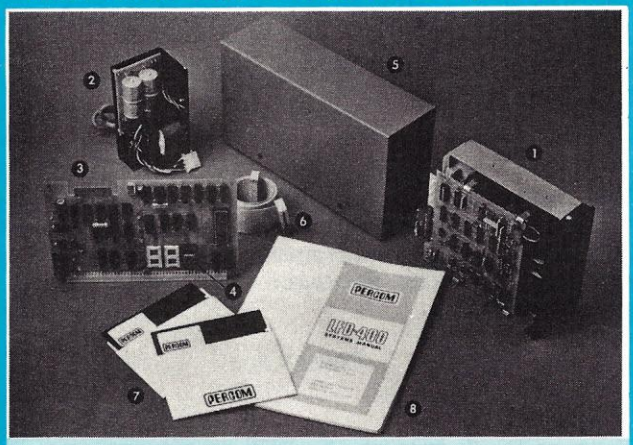

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```
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Nn Oo Pp Qq Rr Ss Tt Uu Vv Ww Xx Yy Zz
1 2 3 4 5 6 7 8 9 0 - ↑ \ @ ; : [ ] , .
! # $ % & ' ( ) = ~ | + * < > ?
        PS-40 CHARACTER SET
```

Example 1.

```
THE PS-40 WILL PRINT LARGE AND SMALL CAPS.
THIS IS A VERY HANDY FEATURE FOR USE WITH
PRINT AND REM STATEMENTS. HIGHLIGHTING OF
KEY WORDS MAKES PROGRAM PROMPTING LINES
MORE READABLE.
```

Example 2.

```
ANOTHER PS-40 FEATURE - DATA AT THE END OF A LIN
E IS NOT LOST.
```

Example 3.

without disturbing anyone (only a few feet away in adjacent rooms). Teletype-like operation with the PS-40 is also possible. Used in this manner, the PS-40 can be the only I/O needed to communicate with a Teletype, serial-data-oriented microcomputer. An ASCII keyboard with seven data bits and a negative-going strobe are also required. Fig. 5 illustrates a system configuration, and Fig. 6 is a connection diagram for the 56-pin edge connector. You may need to provide an inverter for the strobe to make the polarity correct; a spare 7404 IC will do this job nicely. As before, make all the connections to the edge connector first, then connect it to the printer. When everthing's connected and checked out, use the KIM-1 users' manual as a guide for proper Teletype operation.

If printing assembly-language listings and memory dumps is your only requirement, a conceptual KIM-1 command generator circuit may be all that's needed. In Figs. 7 and 8, I have included illustrations of this concept: Fig. 7 shows the block diagram of the system, and Fig. 8 is a concept circuit for the character generator. Remember, this is only a concept. I have done similar things using my ACT-1 TVT, and that's where I got the idea. If you try it and it works, I am sure *Kilobaud* would like to tell the rest of the world for you.

As a manufacturing engineer, I found the Telpar PS-40 printer well constructed. There are a couple of problem areas (requires a multiple-output power source; uses special thermal paper), but I consider them minor.

I estimated the cost of building a power supply from Radio Shack parts at $30 to $35. A well-stocked junk box reduces the cost much further. A roll of thermal paper from Telpar is no more expensive than one of TTY paper and lasts a long time (I have printed everything in sight and not yet used half a roll). A 48-column, 5½-inch-wide roll is $3 from Telpar, Inc., 4132A Billy Mitchell Rd, PO Box 796, Addison TX 75001. The PS-40 costs $4.

Incorporating this printer into my system has been a rewarding experience. The people at Telpar are friendly and pleasant to work with. Rick Ables patiently went over (and over) the operation of the printer and explained all my questions; and Mr. Hanschen, the president of Telpar, made it all possible. Without their help and cooperation, this article might not have been written.■

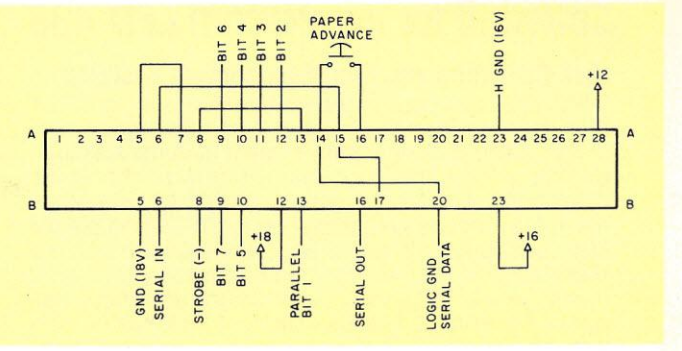

Fig. 6. PS-40 connector, TTY replacement-input and power connections.

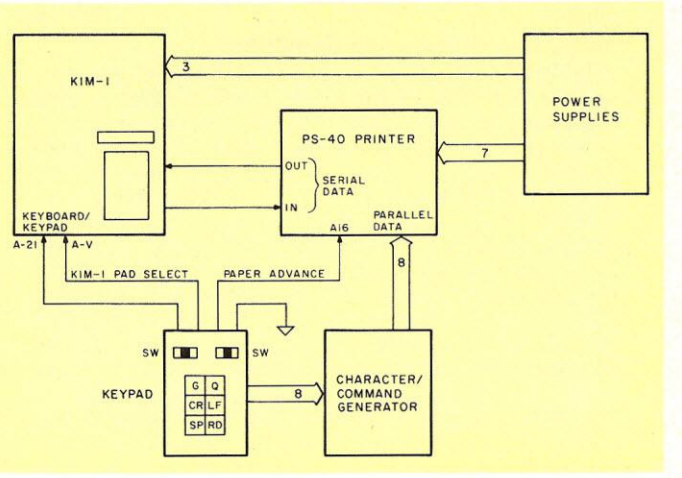

Fig. 7. KIM-1 command generator concept diagram.

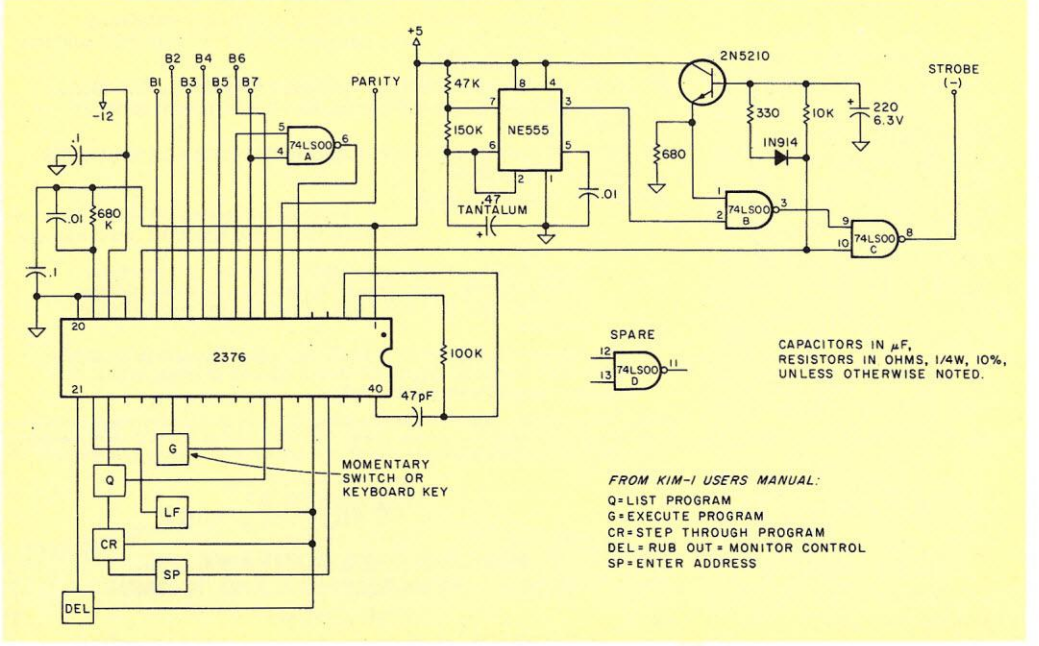

Fig. 8. Command generator schematic.

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Say It with a Banner

It's going to be a banner year, and here's the first entry. We'll keep you posted.

Computers have long been used to generate posters. Most computer hobbyists have seen various calendars printed by computers, and (usually in violation of copyright laws) posters of Snoopy, Star Trek characters and, recently, Star Wars characters. Another form of computer poster that has long been popular is the character-string poster, or "banner."

The program presented here (Program A) is an 8080 assembly-language program to print character-string posters. Four sets of data are available to print in different character styles. The most useful character set (in my opinion) is the Franklin Gothic Wide (FGW) data. This data was obtained by a simple brute-force method: The character set was projected using an opaque projector and traced onto paper already printed up with indications of pica-type spaces.

With great restraint, nonsymmetries present in the character set were retained in the final data, resulting in realistic reproductions of the FGW characters. They are bold characters with very heavy lines and are easily read from a distance. They do, however, take a great deal of time to print (especially on ten-character-per-second terminals).

Another popular character set is Old English. That data was created by Bob Purser by sheer artistic interpretation of Old English characters. As usual in Old English, many characters are not recognizable except by context.

The remaining two character sets are Football Scoreboard and Football Scoreboard Italic, which were my first character sets. They were originally designed for a special poster program that used a different form of data. (An object listing of the Football Scoreboard data is presented in Program B.) The characters consist of an 8 x 8 dot matrix using the six types of dots shown in Fig. 1.

The first inclination in poster programs is to use a standard 5 x 7 or 7 x 9 dot matrix. Although

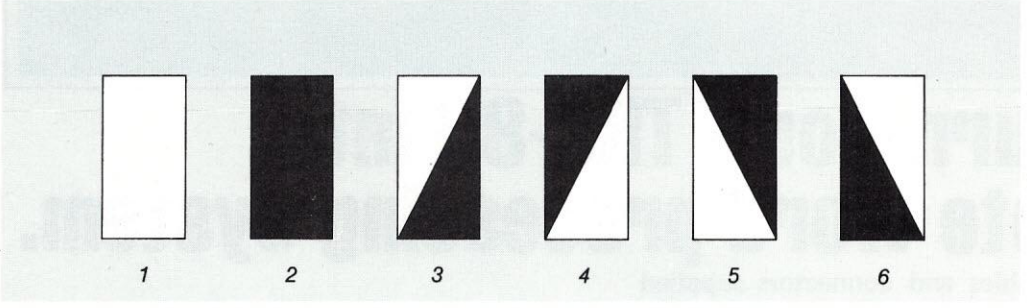
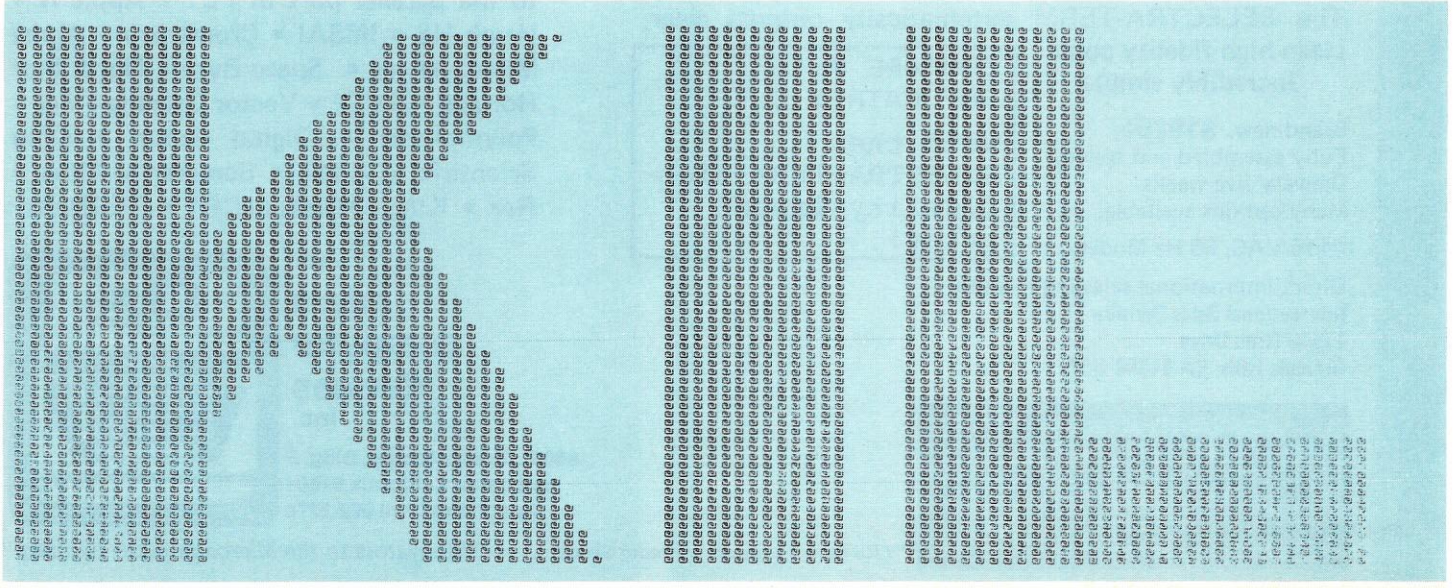
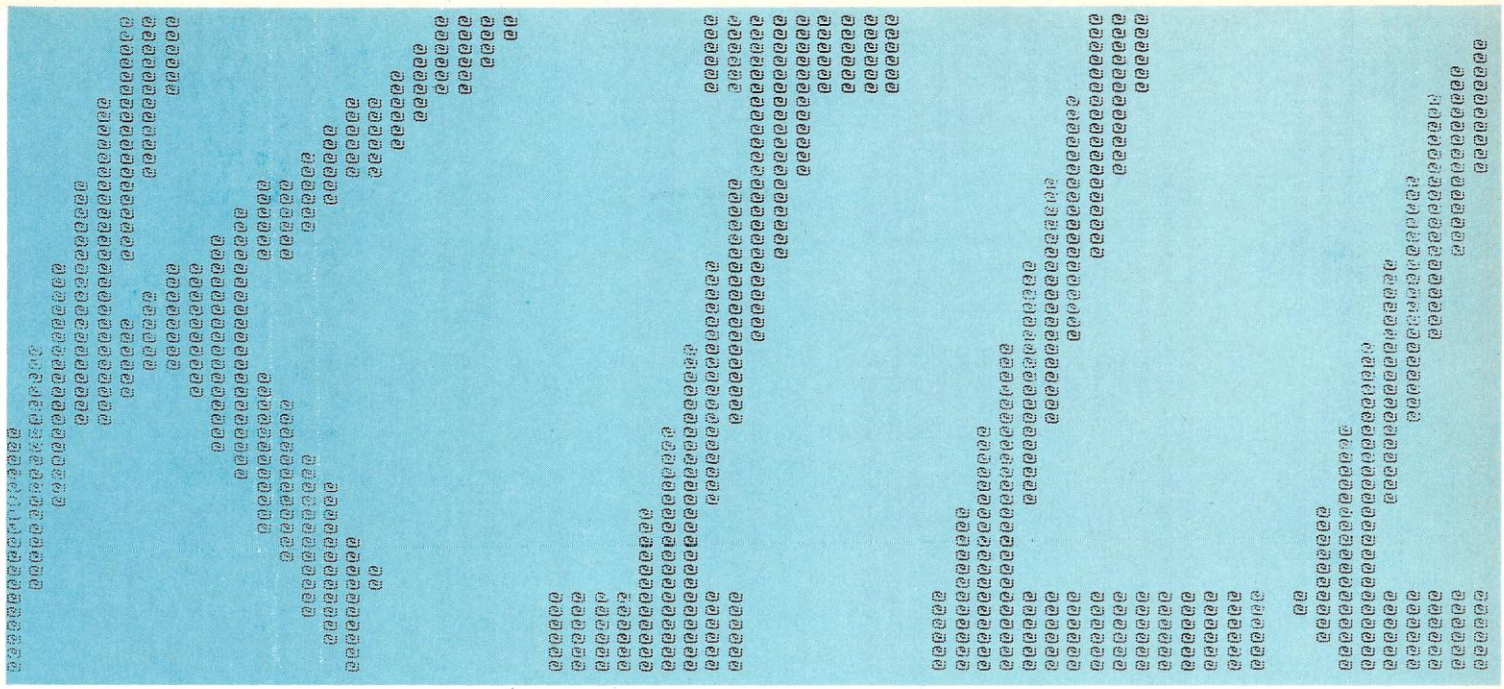


Fig. 1.



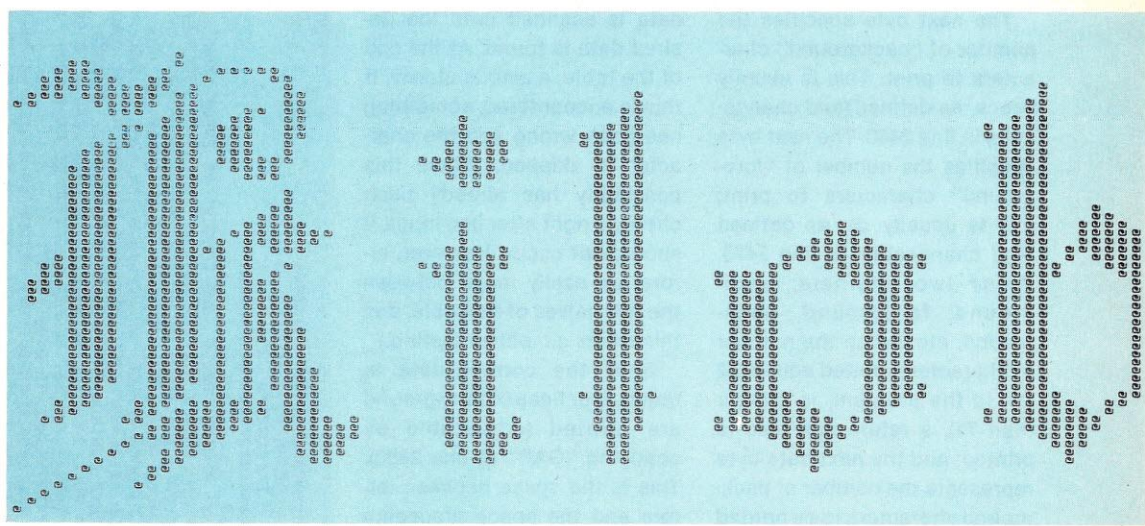


this is fine for printing very small letters with overlapping dots (as on a CRT or a dot-matrix printer), a first attempt will reveal that it is quite poor for poster printing.

Having seen such attempts, I began by solving the corner and diagonal line problems with my six dot types. Using a chessboard (8 x 8, remember?) and several scraps of paper (blank, filled-in and four diagonally half filled-ins), I designed the characters. Each dot is represented by three lines of characters, five characters wide. The italic version was (quite obviously) created by moving each successive dot down by one line; the result is marginally passable.

All four character sets include the characters A through Z (uppercase) and space. Old English also includes lowercase a through z. Franklin Gothic Wide includes 0 through 9, ?, $, !, &, ', comma, semicolon, hyphen, period, colon, and both opening and closing quotes. (The quotes are given in ASCII as open and closed square brackets.) The Football Scoreboard sets include 1 through 9, period, comma, semicolon, ?, !, colon, '', ', (,) and –.

Now for a look at the program. Line 200 sets the stack pointer; this may have to be changed if you don't have RAM at the very highest addresses. The program begins with a standard universal line-input routine. It allows a full line to be input, and has various facilities for editing. ("Sub" is used for Control Z, return, line feed. The Control Z causes the return to be ignored, and line feed is always ignored. This allows you to go to the next line on your terminal to continue input when you reach the end of your carriage. The other features should be reasonably obvious.)

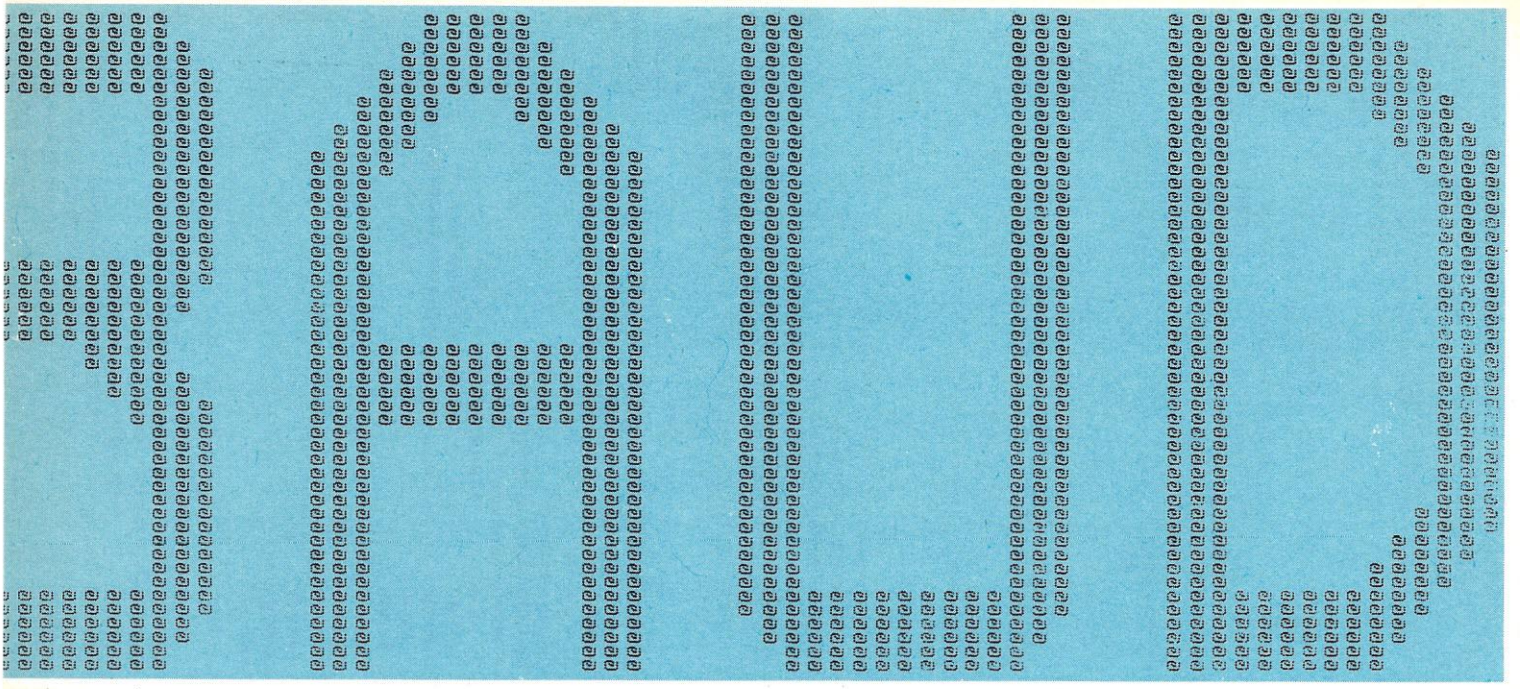


Three routines, which should be tailored to your system, are called. INC (INput Character) begins at line 2500; it reads one character from the keyboard into the A register. No other registers are modified. INCLR (INput CLeaR) clears any input latches or buffers, thus avoiding trouble with keys pressed before the program is run or during printing. It modifies only the A register; source code is found inside INC at line 2530. OUTC (OUTput Character) is found at line 2550; the character in the A register is printed on the terminal; no registers are modified.

Also in this general area at the end of the program are two buffers that must be in RAM. "SPACE" is a one-byte temporary, and "BUF" is the line-input buffer, randomly selected as 72. Since the data follows at 006'000 (600 hex), the buffer could not be much larger if located at its current address. The buffer is easily moved since its location is defined in line 2490 (INBUF). The length of the buffer is also easily changed (both of these parameters can be changed without reassembling the program) since it is defined in line 2480 (INLEN).

The general line-input routine ends at line 870, whereupon the poster-generation program begins. First, a check is made to see if all input characters exist in the character set. This is to avoid the possibility of trying to print a poster for hours, then discovering an impossible request. If any illegal characters are found, they are printed, the line is ignored and the input routine is run again. The character set data begins with a list of characters present in the set (all with the most significant bit being zero) followed by a zero. This information is used to determine whether or not each input character exists.

Next, each character is printed. The remaining data in the character set table contains



the information used to print each letter or symbol. The first byte is the actual character (in ASCII, which is "American Standard Code for Information Interchange," not ASC II or ASC 2 as some would have you believe). The next byte is the number of data bytes following (for the character specified by the first byte).

The next byte specifies the number of "background" characters to print. This is usually space, as defined (and changeable) in line 2460. The next byte specifies the number of "foreground" characters to print; this is usually @, as defined (and changeable) in line 2470. These two alternate: background, foreground, background, etc. When the number of characters printed equals 72 (or, in the program, is greater than 71), a return line feed is printed; and the next data byte represents the number of background characters to be printed even if the most recent data was for background.

To create different effects, the background and foreground characters may be exchanged or set to other characters. If "BACK" is @ and "FORE" is space, an "inverse video" poster is created.

Note that spaces are not printed immediately. When a space is to be printed (by the OUTP routine at line 2220), a counter (SPACE) is incremented. When a non-space character (other than return) is to be printed, first spaces are printed until the counter is zero. When return line feed is printed, the counter is set to zero. This causes trailing spaces to be ignored, resulting in much faster printing except on inverse-video posters.

To print each character, the data is scanned until the desired data is found. At the end of the table, a zero is stored. If this is encountered, something has gone wrong and the character is skipped. (Since this possibility has already been checked right after line input, it should not occur. However, errors are easily made between the two halves of the table, and this check simplifies testing.)

Once the correct data is found, four lines of background are printed (adjustable by changing "GAP" at line 2450). This is the space between letters and the space preceding the first letter. Another gap is printed after the last letter. Note that for the italic character set, GAP should be changed to one since an inherent gap is present. (On inverse-video posters, a space should be used as the first and last character.)

You may wish to replace the jump at line 2170 with a jump to itself to avoid having a colon printed by the input routine at the end of your poster.

The character set data is not included in the source code. (With the object for the program, the data for FGW takes up just under 8K.) It has been added to our object tapes by special programs. It is doubtful that anyone would wish to type this amount of data in manually. Paper tapes are available from ALF Products (128 South Taft; Denver, CO 80228). Source code, $3.50. Object code plus data set tape: Gothic, $3.50; Scoreboard, $2.50; Old English, $3.50; Scoreboard Italic, $3.00. Add $1 per order for postage. ■

Program A.

```
                0010 ;*********************************
                0020 ;*  POSTER GENERATION PROGRAM    *
                0030 ;*     A L F PRODUCTS INC.       *
                0040 ;*********************************
004'000         0050      ORG 400H
004'000         0060 ; THE 'GO' ROUTINE READS (AND ECHOES) AN INPUT LINE.
004'000         0070 ; RETURN (M) ENDS THE LINE, CANCEL (X) PRINTS BACKSLASH
004'000         0080 ; AND ALLOWS LINE INPUT TO BE RESTARTED, BACKSPACE (H)
004'000         0090 ; BACKSPACES OR PRINTS BACKSLASH IF NO CHARS LEFT TO
004'000         0100 ; BACK UP, ACKNOWLEDGE (F) REPRINTS THE LINE SO FAR,
004'000         0110 ; AND SUB (Z) CAUSES THE NEXT CHAR TO ECHO BUT BE IGNORED.
004'000         0120 ; ALL OTHER CONTROLS AND RUBOUT ECHO BUT ARE IGNORED.
004'000         0130 ; BUFFER FULL CAUSES LINE REPRINT. BUFFER LENGTH IS READ
004'000         0140 ; FROM 'INLEN', 0=256. BUFFER LOCATION IS READ FROM 'INBUF'.
004'000         0150 ; PARITY IS MASKED TO 0 ON INPUT.
004'000         0160 ; CHARS ARE STORED IN BUFFER, RETURN IS STORED AS '377. HL
004'000         0170 ; POINTS TO THE NEXT AVAILABLE BYTE IN THE BUFFER DURING
004'000         0180 ; LINE INPUT, C IS THE # OF BYTES INPUT SO FAR. D IS
004'000         0190 ; NORMALLY 0, SET TO 377 TO IGNORE NEXT CHAR (SUB).
004'000 061 000 000 0200 GO LXI SP,0 SET STACK POINTER.
004'003 076 072     0210     MVI A,':' OUTPUT A :.
004'005 315 206 005 0220     CALL OUTC
004'010 052 172 005 0230     LHLD INBUF
004'013 016 000     0240     MVI C,0
004'015 315 203 005 0250 G06 CALL INCLR GET RID OF POSSIBLE GARBAGE.
004'020 026 000     0260 G01 MVI D,0
004'022 315 174 005 0270 G08 CALL INC
004'025 315 206 005 0280     CALL OUTC
004'030 024         0290     INR D
004'031 312 020 004 0300     JZ G01
004'034 346 177     0310     ANI 127
004'036 376 177     0320     CPI 127
004'040 312 020 004 0330     JZ G01 RUBOUT.
004'043 376 015     0340     CPI 'M'-64
004'045 312 214 004 0350     JZ G07 RETURN.
004'050 376 030     0360     CPI 'X'-64
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004'052 312 156 004      0370  JZ G05 RESTART.
004'055 376 010          0380  CPI 'H'-64
004'057 312 144 004      0390  JZ G04 BACKSPACE.
004'062 376 006          0400  CPI 'F'-64
004'064 312 120 004      0410  JZ G03 REPRINT.
004'067 376 032          0420  CPI 'Z'-64
004'071 312 171 004      0430  JZ G09 SUB.
004'074 376 040          0440  CPI ' '
004'076 332 020 004      0450  JC G01 CONTROL CHARS.
004'101 107              0460  MOV B,A
004'102 072 171 005      0470  LDA INLEN
004'105 014              0480  INR C
004'106 271              0490  CMP C
004'107 312 117 004      0500  JZ G02 BUFFER FULL.
004'112 160              0510  MOV M,B
004'113 043              0520  INX H
004'114 303 020 004      0530  JMP G01 ALL WENT WELL.
004'117 015              0540 G02 DCR C (BUFFER FULL.)
004'120 066 000          0550 G03 MVI M,0 (REPRINT.) END MARKER.
004'122 315 176 004      0560  CALL CRLF
004'125 052 172 005      0570  LHLD INBUF
004'130 257              0580 G010 XRA A
004'131 266              0590  ORA M
004'132 312 015 004      0600  JZ G06
004'135 315 206 005      0610  CALL OUTC
004'140 043              0620  INX H
004'141 303 130 004      0630  JMP G010
004'144 257              0640 G04 XRA A (BACKSPACE.)
004'145 261              0650  ORA C
004'146 312 156 004      0660  JZ G05 NOTHING TO BACK UP.
004'151 015              0670  DCR C
004'152 053              0680  DCX H
004'153 303 020 004      0690  JMP G01
004'156 076 134          0700 G05 MVI A,92 (RESTART.)
004'160 315 206 005      0710  CALL OUTC
004'163 315 176 004      0720  CALL CRLF
004'166 303 000 004      0730  JMP GO
004'171 026 377          0740 G09 MVI D,255 (SUB.)
004'173 303 022 004      0750  JMP G08
004'176 076 015          0760 CRLF MVI A,'M'-64 PRINT RETURN LINEFEED.
004'200 315 206 005      0770  CALL OUTC
004'203 257              0780  XRA A
004'204 062 222 005      0790  STA SPACE   RESET "SPACE" COUNT.
004'207 076 012          0800  MVI A,'J'-64
004'211 303 206 005      0810  JMP OUTC
004'214 066 377          0820 G07 MVI M,255 (RETURN.)
004'216                  0830 * END OF LINE. SET LINE POINTER TO 1ST CHAR
004'216                  0840 * & PRINT LINEFEED.
004'216 052 172 005      0850  LHLD INBUF
004'221 076 012          0860  MVI A,'J'-64
004'223 315 206 005      0870  CALL OUTC
004'226 257              0880  XRA A
004'227 062 222 005      0890  STA SPACE  INITIALIZE "SPACE".
004'232                  0900 * FIRST CHECK TO SEE THAT ALL INPUT CHARS EXIST
004'232                  0910 * IN THE DATA. FORMAT OF FIRST PART OF TABLE IS
004'232                  0920 * A LIST OF AVAILABLE CHARS FOLLOWED BY A 0.
004'232                  0930 * B IS NORMALLY 0, IS SET TO -1 IF ERROR FOUND.
004'232                  0940 * (BAD CHARS ARE PRINTED.) DE IS TABLE POINTER,
004'232                  0950 * HL IS BUFFER POINTER.
004'232 006 000          0960  MVI B,0
004'234 021 000 006      0970 CHK LXI D,TABLE
004'237 032              0980 CHK3 LDAX D
004'240 267              0990  ORA A
004'241 302 262 004      1000  JNZ CHK1
004'244                  1010 * NOT IN TABLE. END OF BUFFER OR BAD CHAR?
004'244 257              1020  XRA A
004'245 266              1030  ORA M
004'246 372 273 004      1040  JM CHK2 END OF BUFFER.
004'251 006 377          1050  MVI B,255 BAD CHAR FOUND.
004'253 043              1060  INX H
004'254 315 206 005      1070  CALL OUTC
004'257 303 234 004      1080  JMP CHK
004'262                  1090 * CHECK TABLE ENTRY.
004'262 276              1100 CHK1 CMP M FOUND IN TABLE?
004'263 023              1110  INX D
004'264 302 237 004      1120  JNZ CHK3 NOT YET.
004'267 043              1130  INX H FOUND.
004'270 303 234 004      1140  JMP CHK CHECK NEXT.
004'273                  1150 * ALL CHARS CHECKED. ANY BAD ONES?
004'273 004              1160 CHK2 INR B
004'274 302 305 004      1170  JNZ PRNT NO BAD ONES.
004'277                  1180 * BAD CHARS FOUND, CRLF AND GO BACK TO INPUT.
004'277 315 176 004      1190  CALL CRLF
004'302 303 000 004      1200  JMP GO
004'305                  1210 *
004'305                  1220 * PRINT THE POSTER.
004'305                  1230 *
004'305 023              1240 PRNT INX D   DE POINTS TO THE SECOND HALF OF THE TABLE.
004'306 052 172 005      1250  LHLD INBUF  HL POINTS TO INPUT BUFFER.
004'311                  1260 * SECOND HALF OF TABLE CONTAINS MANY ENTRIES, EACH
004'311                  1270 * CONSISTS OF: (1) THE CHAR FOR WHICH DATA FOLLOWS,
004'311                  1280 * (2) THE LENGTH OF THE DATA FOLLOWING, AND (3)
004'311                  1290 * THE DATA. WHEN ITEM (1) IS 0, END-OF-TABLE IS FOUND.
004'311 353              1300  XCHG
004'312                  1310 * DE WILL BE THE BUFFER POINTER, HL THE TABLE POINTER.
004'312 032              1320 FIND1 LDAX D END OF BUFFER?
004'313 267              1330  ORA A
004'314 372 062 005      1340  JM DONE  YES.
004'317 345              1350  PUSH H  NO, SAVE TABLE POINTER.
004'320 006 000          1360  MVI B,0 FOR DAD B.
004'322 257              1370 FIND2 XRA A
004'323 266              1380  ORA M
004'324 302 334 004      1390  JNZ FIND3
004'327                  1400 * END-OF-TABLE FOUND (ERROR). SKIP CHAR AND PROCEED.
004'327 341              1410 NEXT POP H  RECOVER TABLE POINTER.
004'330 023              1420  INX D
004'331 303 312 004      1430  JMP FIND1
004'334                  1440 * LOOK FOR CORRECT DATA.
004'334 032              1450 FIND3 LDAX D
004'335 276              1460  CMP M MATCH?
004'336 312 350 004      1470  JZ FIND4 YES. DATA FOUND.
004'341 043              1480  INX H
004'342 116              1490  MOV C,M NO MATCH, LOAD LENGTH INTO BC.
004'343 043              1500  INX H
004'344 011              1510  DAD B  SKIP OVER DATA.
004'345 303 322 004      1520  JMP FIND2 TRY NEXT DATA.
004'350 043              1530 FIND4 INX H
004'351 116              1540  MOV C,M
004'352 043              1550  INX H
004'353                  1560 * CORRECT DATA FOUND. HL NOW POINTS TO DATA, C IS LENGTH
004'353                  1570 * OF DATA. FOR EACH LINE, FIRST BYTE IS NUMBER OF BACKGROUN
004'353                  1580 * CHARS TO PRINT, NEXT BYTE IS NUMBER OF FOREGROUND CHARS
004'353                  1590 * TO PRINT, THEN BACKGROUND, ETC. WHEN TOTAL CHARS ON LINE
004'353                  1600 * SO FAR IS 72, CRLF AND START NEXT LINE. PRECEED EACH
004'353                  1610 * CHAR WITH A FEW LINES OF BACKGROUND.
004'353 325              1620  PUSH D
004'354 072 166 005      1630  LDA GAP # OF LINES BETWEEN.
004'357 127              1640  MOV D,A
004'360 036 110          1650 PRNT1 MVI E,72
004'362 072 167 005      1660 PRNT2 LDA BACK
004'365 315 114 005      1670  CALL OUTP
004'370 035              1680  DCR E
004'371 302 362 004      1690  JNZ PRNT2
004'374 315 176 004      1700  CALL CRLF
004'377 025              1710  DCR D
005'000 302 360 004      1720  JNZ PRNT1
005'003                  1730 * GAP PRINTED. PROCEED WITH CHAR. REMEMBER DE IS ON STACK.
005'003 072 167 005      1740 PRNT3 LDA BACK
005'006 127              1750  MOV D,A
005'007 072 170 005      1760  LDA FORE
005'012 137              1770  MOV E,A  AT NEW LINE: D IS BACK, E IS FORE.
005'013 006 000          1780  MVI B,0  B IS CHAR COUNT SO FAR.
005'015 176              1790 PRNT5 MOV A,M  GET COUNT.
005'016 345              1800  PUSH H
005'017 147              1810  MOV H,A
005'020 200              1820  ADD B
005'021 107              1830  MOV B,A UPDATE COUNT SO FAR.
005'022 172              1840 PRNT4 MOV A,D  GET CHAR TO PRINT.
005'023 315 114 005      1850  CALL OUTP
005'026 045              1860  DCR H
005'027 302 022 005      1870  JNZ PRNT4
005'032 172              1880  MOV A,D
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005'033 123             1890  MOV D,E
005'034 137             1900  MOV E,A SWITCH BACK & FORE.
005'035 341             1910  POP H
005'036 043             1920  INX H
005'037 015             1930  DCR C  ONE MORE BYTE OF DATA USED.
005'040 076 107         1940  MVI A,71
005'042 270             1950  CMP B LINE DONE?
005'043 322 015 005     1960  JNC PRNT5 NO.
005'046                 1970 * END OF LINE REACHED. END OF WHOLE CHAR TOO?
005'046 315 176 004     1980  CALL CRLF
005'051 015             1990  DCR C
005'052 014             2000  INR C
005'053 302 003 005     2010  JNZ PRNT3 NO, DO NEXT LINE.
005'056                 2020 * END OF WHOLE CHAR.
005'056 321             2030  POP D
005'057 303 327 004     2040  JMP NEXT
005'062                 2050 * END OF POSTER. PRINT TRAILING GAP.
005'062 072 166 005     2060 DONE LDA GAP  # OF LINES.
005'065 127             2070  MOV D,A
005'066 036 110         2080 DONE1 MVI E,72
005'070 072 167 005     2090 DONE2 LDA BACK
005'073 315 114 005     2100  CALL OUTP
005'076 035             2110  DCR E
005'077 302 070 005     2120  JNZ DONE2
005'102 315 176 004     2130  CALL CRLF
005'105 025             2140  DCR D
005'106 302 066 005     2150  JNZ DONE1
005'111                 2160 * GAP PRINTED. GO BACK TO INPUT.
005'111 303 000 004     2170  JMP GO
005'114                 2180 * OUTP ROUTINE PRINTS BUT SKIPS SPACES. SPACES ARE
005'114                 2190 * COUNTED SO THEY CAN BE PRINTED IF NECESSARY, BUT
005'114                 2200 * TRAILING SPACES WILL NEVER BE PRINTED. COUNT OF
005'114                 2210 * SPACES LEFT IS IN "SPACE".
005'114 376 040         2220 OUTP CPI ' '
005'116 312 154 005     2230  JZ OUTP1
005'121 365             2240  PUSH PSW
005'122 072 222 005     2250  LDA SPACE
005'125 074             2260  INR A
005'126 075             2270 OUTP2 DCR A
005'127 062 222 005     2280  STA SPACE
005'132 312 150 005     2290  JZ OUTP3
005'135 076 040         2300  MVI A,' '
005'137 315 206 005     2310  CALL OUTC
005'142 072 222 005     2320  LDA SPACE
005'145 303 126 005     2330  JMP OUTP2
005'150 361             2340 OUTP3 POP PSW
005'151 303 206 005     2350  JMP OUTC
005'154                 2360 * SPACE FOUND. JUST COUNT IT.
005'154 072 222 005     2370 OUTP1 LDA SPACE
005'157 074             2380  INR A
005'160 062 222 005     2390  STA SPACE
005'163 076 040         2400  MVI A,' ' JUST TO BE NICE.
005'165 311             2410  RET
005'166                 2420 * CONSTANTS, BUFFERS, TABLES, AND I/O ROUTINES.
005'166                 2430 PSW EQU 6
005'166                 2440 SP EQU 6
005'166 004             2450 GAP DB 4
005'167 040             2460 BACK DB ' '
005'170 100             2470 FORE DB '@'
005'171 110             2480 INLEN DB 72
005'172 223 005         2490 INBUF DW BUF
005'174 333 176         2500 INC IN 126
005'176 346 001         2510  ANI 1
005'200 312 174 005     2520  JZ INC
005'203 333 177         2530 INCLR IN 127
005'205 311             2540  RET
005'206 365             2550 OUTC PUSH PSW
005'207 333 176         2560 OUTC1 IN 126
005'211 346 200         2570  ANI 128
005'213 312 207 005     2580  JZ OUTC1
005'216 361             2590  POP PSW
005'217 323 177         2600  OUT 127
005'221 311             2610  RET
005'222                 2620 SPACE DS 1
005'223                 2630 BUF DS 72
005'333                 2640 TABLE EQU 600H
```

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011'020:  006 006 074 006 006 074 006 006 074 006 006 074 006 006 074 006
011'040:  006 074 006 006 074 006 006 074 006 006 074 006 006 074 115 077
011'060:  006 060 022 006 060 022 006 060 022 056 010 022 054 010 024 052
011'100:  010 026 050 010 030 046 010 032 044 010 034 044 006 036 044 006
011'120:  036 044 006 036 044 010 034 046 010 032 050 010 030 052 010 026
011'140:  054 010 024 056 010 022 006 060 022 006 060 022 006 060 022 116
011'160:  077 006 060 022 006 056 024 006 054 026 050 010 030 046 010 032
011'200:  044 010 034 042 010 036 040 010 040 036 010 042 034 010 044 032
011'220:  010 046 030 010 050 026 010 052 024 010 054 022 010 056 020 010
011'240:  060 016 010 062 014 010 064 012 054 022 010 056 022 006 060 022
011'260:  117 077 012 050 026 010 054 024 006 060 022 006 006 044 006 022
011'300:  006 006 044 006 022 006 006 044 006 022 006 006 044 006 022 006
011'320:  006 044 006 022 006 006 044 006 022 006 006 044 006 022 006 006
011'340:  044 006 022 006 006 044 006 022 006 060 022 010 054 024 012 050
011'360:  026 120 077 006 060 022 006 060 022 006 060 022 036 006 014 006
012'000:  022 036 006 014 006 022 036 006 014 006 022 036 006 014 006 022
012'020:  036 006 014 006 022 036 006 014 006 022 036 006 014 006 022 036
012'040:  006 014 006 022 036 006 014 006 022 036 030 022 040 024 024 042
012'060:  020 026 121 103 026 026 034 024 032 032 022 036 030 020 010 022
012'100:  010 026 016 010 026 010 024 014 010 032 010 022 014 006 036 006
012'120:  022 014 006 036 006 022 014 006 036 006 022 014 014 026 010 022
012'140:  014 012 026 010 024 014 010 026 010 026 012 046 030 010 010 004
012'160:  032 032 006 010 010 026 034 122 144 006 060 022 006 060 022 006
012'200:  060 022 034 010 014 006 022 032 012 014 006 022 030 014 014 006
012'220:  022 026 016 014 006 022 024 010 002 006 014 006 022 022 010 004
012'240:  006 014 006 022 020 010 006 006 014 006 022 016 010 010 006 014
012'260:  006 022 014 010 012 006 014 006 022 012 010 014 006 014 006 022
012'300:  010 010 016 006 014 006 022 006 010 020 006 014 006 022 006 006
012'320:  022 030 022 006 004 026 024 024 006 002 032 020 026 123 135 006
012'340:  006 026 020 026 006 006 024 024 024 006 006 022 030 022 006 006
012'360:  022 006 014 006 022 006 006 022 006 014 006 022 006 006 022 006
013'000:  014 006 022 006 006 022 006 014 006 022 006 006 022 006 014 006
013'020:  022 006 006 022 006 014 006 022 006 006 022 006 014 006 022 006
013'040:  006 022 006 014 006 022 006 006 022 006 014 006 022 006 036 014
013'060:  006 022 010 032 016 006 022 012 026 020 006 022 124 055 060 006
013'100:  022 060 006 022 060 006 022 060 006 022 060 006 022 060 006 022
013'120:  006 060 022 006 060 022 006 060 022 060 006 022 060 006 022 060
013'140:  006 022 060 006 022 060 006 022 060 006 022 125 055 012 054 022
013'160:  010 056 022 006 060 022 006 006 074 006 006 074 006 006 074 006
013'200:  006 074 006 006 074 006 006 074 006 006 074 006 006 074 006 006
013'220:  074 006 060 022 010 056 022 012 054 022 126 055 020 046 022 016
013'240:  050 022 014 052 022 012 010 066 010 010 070 006 010 072 006 006
013'260:  074 006 006 074 006 006 074 006 010 072 010 010 070 012 010 066
013'300:  014 052 022 016 050 022 020 046 022 127 077 006 060 022 006 060
013'320:  022 006 060 022 006 010 072 010 010 070 012 010 066 014 010 064
013'340:  016 010 062 020 010 060 022 006 060 022 006 060 022 006 060 020
013'360:  010 060 016 010 062 014 010 064 012 010 066 010 010 070 006 010
014'000:  072 006 060 022 006 060 022 006 060 022 130 137 006 010 040 010
014'020:  022 010 010 034 010 024 012 010 030 010 026 014 010 024 010 030
014'040:  016 010 020 010 032 020 010 014 010 034 022 010 010 010 036 024
014'060:  010 004 010 040 026 020 042 030 014 044 030 014 044 030 014 044
014'100:  026 020 042 024 010 004 010 040 022 010 010 010 036 020 010 014
014'120:  010 034 016 010 020 010 032 014 010 024 010 030 012 010 030 010
014'140:  026 010 010 034 010 024 006 010 040 010 022 131 055 056 010 022
014'160:  054 010 024 052 010 026 050 010 030 046 010 032 044 010 034 006
014'200:  044 036 006 044 036 006 044 036 044 010 034 046 010 032 050 010
014'220:  030 052 010 026 054 010 024 056 010 022 132 203 006 010 042 006
014'240:  022 006 012 040 006 022 006 014 036 006 022 006 016 034 006 022
014'260:  006 006 002 010 032 006 022 006 006 004 010 030 006 022 006 006
014'300:  006 010 026 006 022 006 006 010 010 024 006 022 006 006 012 010
014'320:  022 006 022 006 006 014 010 020 006 022 006 006 016 010 016 006
014'340:  022 006 006 020 010 014 006 022 006 006 022 010 012 006 022 006
014'360:  006 024 010 010 006 022 006 006 026 010 006 006 022 006 006 030
015'000:  010 004 006 022 006 006 032 010 002 006 022 006 006 034 016 022
015'020:  006 006 036 014 022 006 006 040 012 022 006 006 042 010 022 061
015'040:  041 006 006 036 010 026 006 006 040 010 024 006 006 042 010 022
015'060:  006 060 022 006 060 022 006 060 022 006 006 074 006 006 074 006
015'100:  006 074 062 135 006 024 020 010 026 006 026 020 010 024 006 030
015'120:  020 010 022 006 006 014 006 022 006 022 006 006 014 006 022 006
015'140:  022 006 006 014 006 022 006 022 006 006 014 006 022 006 022 006
015'160:  006 014 006 022 006 022 006 006 014 006 022 006 022 006 006 014
015'200:  006 022 006 022 006 006 014 006 022 006 022 006 006 014 006 022
015'220:  006 022 006 006 014 036 022 006 006 016 032 024 006 006 020 026
015'240:  026 063 131 012 010 036 006 022 010 010 040 006 022 006 010 042
015'260:  006 022 006 006 044 006 022 006 006 044 006 022 006 006 044 006
015'300:  022 006 006 026 004 012 006 022 006 006 024 010 010 006 022 006
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Program B. Football Scoreboard poster data.

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006'000:  101 102 103 104 105 106 107 110 111 112 113 114 115 116 117 120
006'020:  121 122 123 124 125 126 127 130 131 132 061 062 063 064 065 066
006'040:  067 070 071 040 056 054 073 077 041 072 042 047 050 051 055 000
006'060:  101 077 006 046 034 006 050 032 006 052 030 030 006 014 010 026
006'100:  030 006 016 010 024 030 006 020 010 022 030 006 022 006 022 030
006'120:  006 022 006 022 030 006 022 006 022 030 006 020 010 022 030 006
006'140:  016 010 024 030 006 014 010 026 006 052 030 006 050 032 006 046
006'160:  034 102 125 006 060 022 006 060 022 006 060 022 006 006 022 006
006'200:  014 006 022 006 006 022 006 014 006 022 006 006 022 006 014 006
006'220:  022 006 006 022 006 014 006 022 006 006 022 006 014 006 022 006
006'240:  006 022 006 014 006 022 006 006 020 010 014 006 022 006 006 016
006'260:  012 014 006 022 006 006 014 014 014 006 022 006 060 022 010 024
006'300:  004 024 024 012 020 010 020 026 103 105 012 050 026 010 054 024
006'320:  006 060 022 006 006 044 006 022 006 006 044 006 022 006 006 044
006'340:  006 022 006 006 044 006 022 006 006 044 006 022 006 006 044 006
006'360:  022 006 006 044 006 022 006 006 044 006 022 006 006 044 006 022
007'000:  006 010 040 010 022 010 010 034 010 024 012 010 030 010 026 104
007'020:  077 006 060 022 006 060 022 006 060 022 006 006 044 006 022 006
007'040:  006 044 006 022 006 006 044 006 022 006 006 044 006 022 006 006
007'060:  044 006 022 006 006 044 006 022 006 010 040 010 022 010 010 034
007'100:  010 024 012 010 030 010 026 014 044 030 016 040 032 020 034 034
007'120:  105 127 006 060 022 006 060 022 006 060 022 006 006 022 006 014
007'140:  006 022 006 006 022 006 014 006 022 006 006 022 006 014 006 022
007'160:  006 006 022 006 014 006 022 006 006 022 006 014 006 022 006 006
007'200:  022 006 014 006 022 006 006 022 006 014 006 022 006 006 022 006
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007'320:  006 022 036 006 014 006 022 036 006 014 006 022 036 006 014 006
007'340:  022 060 006 022 060 006 022 060 006 022 107 113 012 050 026 010
007'360:  054 024 006 060 022 006 006 044 006 022 006 006 044 006 022 006
010'000:  006 044 006 022 006 006 044 006 022 006 006 044 006 022 006 006
010'020:  044 006 022 006 006 014 006 022 006 022 006 006 014 006 022 006
010'040:  022 006 006 014 006 022 006 022 006 030 020 010 022 010 026 016
010'060:  010 024 012 024 014 010 026 110 055 006 060 022 006 060 022 006
010'100:  060 022 036 006 044 036 006 044 036 006 044 036 006 044 036 006
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017'240:  006 022 006 006 014 006 022 006 022 006 006 014 006 022 006 022
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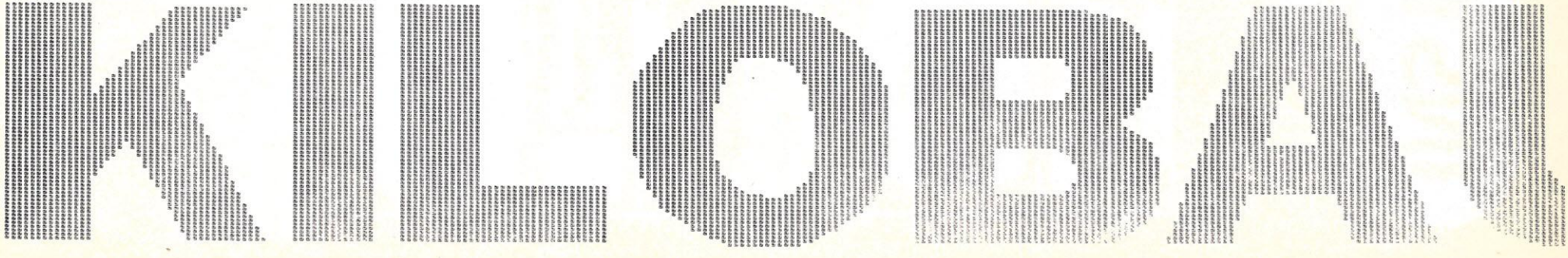

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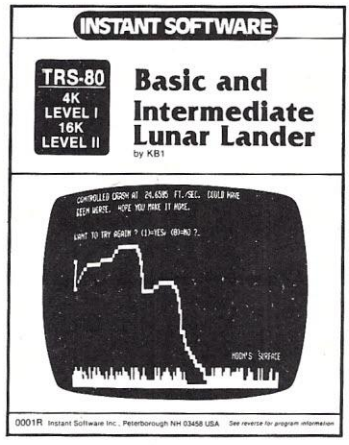
*IMP™ for TRS-80 ONLY $7.95 ea.

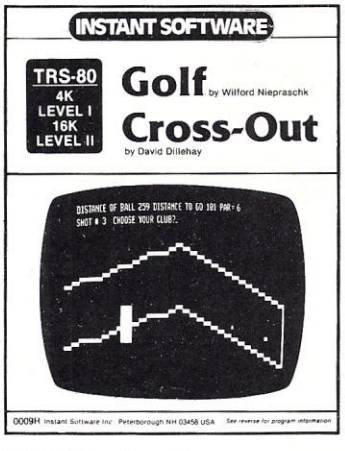
Level I on one side, Level II on the other

● SPACE TREK II— by KB1 (for the TRS-80™) This Space Trek game will challenge the most skillful and careful player. As commander of the Enterprise, you must defend the galaxy against enemy Klingon warships using your arsenal of phasers and photon torpedoes to best advantage. The Enterprise is also equipped with impulse power for moving within the quadrant, and warp power for jumping from quadrant to quadrant. $7.95. Order no. 0002R.

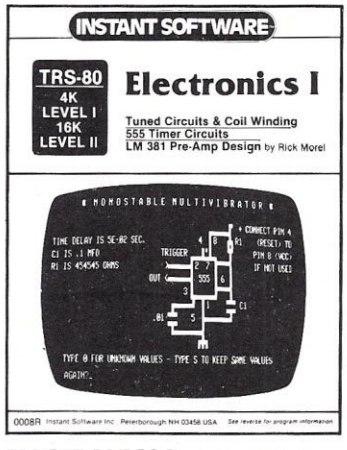


● BASIC LUNAR LANDER/INTERMEDIATE LUNAR LANDER— by KB1 (for TRS-80™) Your automatic landing system has malfunctioned and you are forced to make a manual landing. Taking control at 15,000 feet, the pilot's success requires precise manipulation of the lunar lander's retro-rockets. After mastering the basic game, the able commander will be taxed by the difficult intermediate program. $7.95. Order no. 0001R.

● BEGINNER'S BACKGAMMON/KENO—by Fred Schild and KB1 (for the TRS-80™). You will never be in need of a backgammon companion again! Schild's program is designed for the newcomer to the game, but the computer's steady play will challenge the careless expert. **KENO** is a popular Las Vegas gambling game. As in many games of chance, the odds are against you, but when you win you can win big. $7.95. Order no. 0004R.



● GOLF/CROSS-OUT—by Wilford Niepraschk and David Dillehay. Playing golf on a computer? You bet and frustrating, too. You have your choice of seven clubs—three irons, three woods, a chip and a putter. The program has 18 different fairways, each diabolically designed. You have to pick the right club and angle for hitting the ball or else you end up in the woods or a trap. The green calls for putting skill. The program has excellent graphics and you'll have a ball . . . golf ball. **CROSS-OUT** is the old peg puzzle, but in computer form. You have to jump pegs, removing each one jumped. The idea is to end up with but one peg, and that one in the middle hole. The program will rate your skill at the end of each try. $7.95. Order no. 0009R.



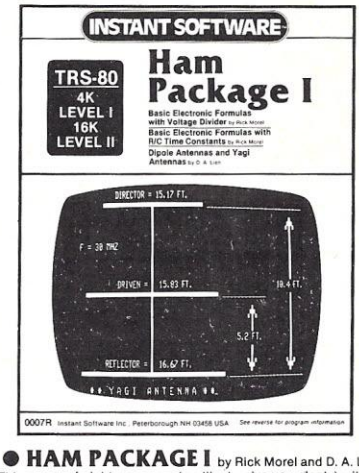
● ELECTRONICS I by Rick Morel. With this group of five programs you will be able to design coils for radio circuits, calculate the component values for tuned circuits, design preamplifiers using the LM-381 IC and timer circuits, either monostable or astable using the 555 timer IC.

Coils can be designed with the use of tables or special calculators, but they are difficult to use. This package has a coil designing program which is simple to use and the computer does all the work.

There is also a program for designing tuned circuits, audio or radio frequency—fixed or variable frequency.

The LM-381 program draws the circuit diagram and gives you the component values for your needs. It will calculate any unknown values for you. The two 555 programs do the same, giving you the diagrams for either one-shot timers or astable timing systems (clocks). It will do all the calculations for you, providing times or component values.

These programs are not only helpful around any workshop or lab, they also are wonderful for teaching the fundamentals of electronics to newcomers. $7.95. Order no. 0008R.



● HAM PACKAGE I by Rick Morel and D. A. Lien. This group of eight programs (we like to give you plenty) will be of frequent help to any experimenter or ham operator.

OHM'S LAW CALCULATIONS	SERIES CAPACITANCES
FREQUENCY VS REACTANCE	PARALLEL CAPACITANCES
SERIES RESISTANCES	DIPOLE DESIGN
PARALLEL RESISTANCES	YAGI DESIGN

These programs draw the circuits or antennas involved and let you fill in the pertinent data, giving you the dimensions, etc.

This series of programs is not only an excellent way to learn the fundamentals of electronics and the handling of simple formulas, they will also be of constant use in any workshop or hamshack. $7.95. Order no. 0007R.

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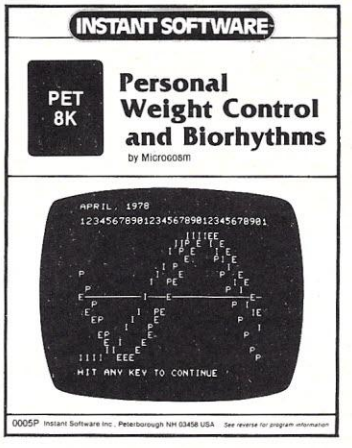
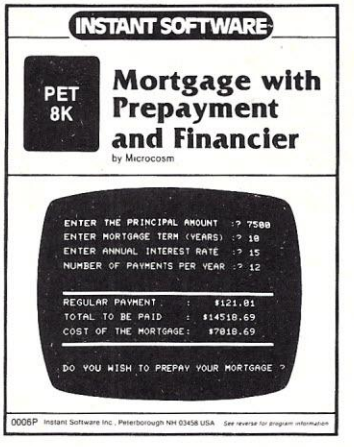




● PERSONAL WEIGHT CONTROL/ BIORHYTHMS—by Microcosm (for the PET™) Here's a program that will let you chart any individual's biorhythm cycle, showing physical, emotional, and intellectual highs and lows. If your neighbors find out you've got it, they will never leave you in peace. **PERSONAL WEIGHT CONTROL** is a must for the diet-conscious. Once your ideal weight has been determined, the program will calculate the correct daily caloric intake necessary to reach your goal over a certain time period. $7.95. Order no. 0005P.

$7.95 ea.

● MORTGAGE WITH PREPAYMENT OPTION/FINANCIER—by Microcosm (for the PET™) Before you go to the bank, calculate your mortgage payment schedule and find out what you can afford. You will learn how much prepayments save, and can easily compare the true costs of variations in interest. **FINANCIER** is actually three programs in one and is guaranteed to make you a financial wizard. In part I you'll learn to tell which investments will pay off. Part II calculates annual depreciation schedules, providing rates, amounts, and salvage values, which is great when tax time rolls around. The final section figures costs of borrowing, payment terms, and remaining balances on loans of all sizes. $7.95. Order no. 0006P.

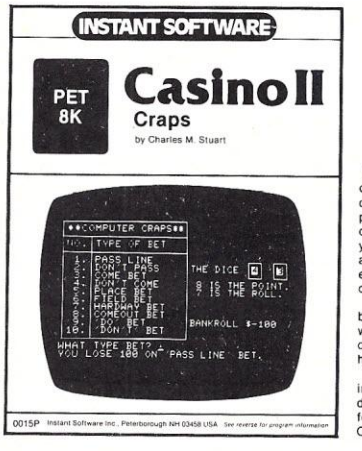
● CASINO I by Charles M. Stuart. There are blackjack games galore, but not many of them are so dependable that you can use them to prepare to make your fortune at Vegas. This blackjack program is not only fun to play, it is also tutorial and allows you to play every combination which you could play at the MGM Grand Hotel in Las Vegas.

There are several systems which will beat the house at blackjack, but before you go investing your cash in a get rich quick attempt, try out your system on this program and see how it does in actual practice.

Roulette programs are more difficult to find, yet this is another very popular casino game—and one you'll want to get some experience with before you venture to go up against the professionals at Vegas. Remember that there are a lot of people who have worked out systems to beat the house at these games and they make a comfortable living going to Vegas every now and then to rebuild their fortunes.

This roulette program is tutorial and gives you the odds on each type of bet.

All you need is the expertise and a little luck to go along with it and you'll pay for your computer in no time. $7.95. Order no. 0014P.



● CASINO II by Charles M. Stuart—Yes, there are a lot of craps programs around—so why should you buy this one? The big difference is that this one is not just a crap game, it is also a tutorial program which will give you the odds on every type of bet so you can steer clear of the idiot bets that improverish the unwary. Did you know that there are bets which give the house as little as 0.8% advantage? It takes precious little luck to overcome such a slight edge—but you have to know where to find these bets before you can use them.

If you use this program to get experienced with craps you should be able to walk away from any craps table a winner. Once you know what bets to make and are able thereby to take the best advantage of lucky streaks, betting lightly to wait through the lean times, you'll have quite an edge.

This program uses the exact rules used at the MGM Grand Hotel in Las Vegas, so you'll be playing under actual gambling house conditions. You should be able not only to pay for the program, but also for your computer system the next time you go to Vegas or Atlantic City. $7.95. Order no. 0015P.

Send me the following Instant Software:

Quantity	Catalog	Program name	Unit Cost	Total cost
			$7.95	
			7.95	
			7.95	
			7.95	
			Shipping	$1.00
			Total order	

☐ Check ☐ Money Order ☐ VISA ☐ AMEX

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Dept. K-1

*Instant Micro Programs

Open House

This interactive search and sort program is designed to help real estate agencies find properties for customers. Though written in Wang BASIC, a few changes will adapt it to most other BASICs. A floppy-disk system would be helpful, but isn't required, to use the program.

```
ENTER THE LISTING NUMBER, IF KNOWN                                  Display No. 1
KEY RETURN IF UNKNOWN



ENTER THE DESIRED DISTRICT CODE # OR KEY RETURN TO SKIP             Display No. 2
CODE # - DESCRIPTION
  1    - CHENANGO BRIDGE, PORT DICK, HILLCREST, WHITNEY POINT,
         CHENANGO, DICKINSON, FENTON, BARKER, LISLE, TRIANGLE
  2    - TOWNS OF CONKLIN, KIRKWOOD, WINDSOR, & COLESVILLE
  3    - CITY OF BINGHAMTON, TOWN OF BINGHAMTON
  4    - JOHNSON CITY, WESTOVER, FAIRMONT PARK
  5    - ENDWELL, ENDICOTT, TOWNS OF MAINE & NANTICOKE
  6    - VESTAL
  7    - VILLAGE OF OWEGO
  8    - SUBURBAN TIOGA COUNTY
  9    - TIOGA COUNTY SUBDIVISIONS
 10    - CHENANGO COUNTY
 11    - STATE OF PENNSYLVANIA
 12    - MISCELLANEOUS



ENTER THE DESIRED PROPERTY CODE # OR KEY RETURN TO SKIP             Display No. 3
CODE # - DESCRIPTION
  1    - RANCH
  2    - CAPE COD
  3    - TWO STORY
  4    - SPLIT LEVEL
  5    - SPLIT ENTRY
  6    - MULTIPLE
  7    - VACANT



ENTER LOWER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP          Display No. 4



ENTER UPPER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP          Display No. 5



ENTER NUMBER OF BEDROOMS DESIRED OR KEY RETURN TO SKIP              Display No. 6
ENTER NUMBER OF UNITS DESIRED OR KEY RETURN TO SKIP
ENTER NUMBER OF ACRES DESIRED OR KEY RETURN TO SKIP
```

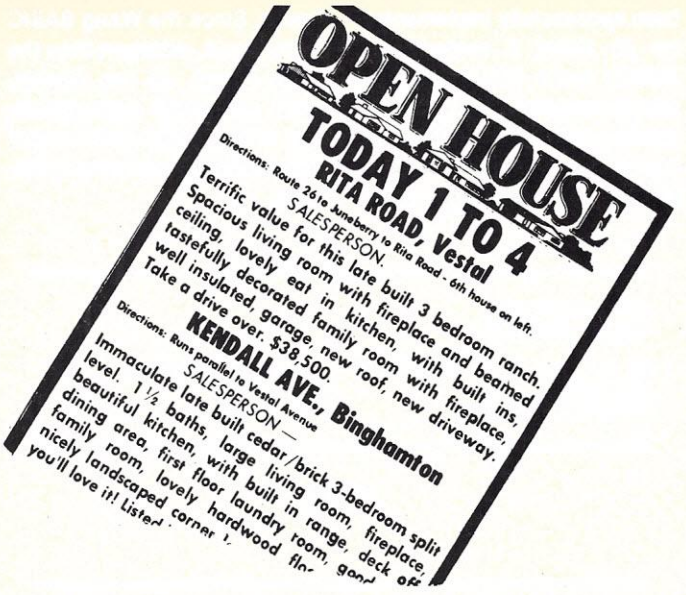
Fig. 1. CRT display questions.

Richard J. Nitto
1040 Pennsylvania Ave. R.D. #2
Binghamton NY 13903

Every week, prospective house-buyers look through hundreds of ads in hopes of finding a house that will meet their needs and can be purchased on their income. Sometimes, two or three ads look promising to a family, which spends its Sunday driving from site to site, looking at homes, one of which could end up being theirs. Should these visits not prove fruitful, the same basic ritual will probably be performed on subsequent weekends. After a few tiring Sundays such as these, the family may contact a friendly real estate salesman, probably one they've met at a previous open house and who, no doubt, has offered to spend his time helping the family find its dream house.

Since house-shopping, at its best, can be a very trying experience, it will benefit both the buyer and the real estate broker to make the looking process as short and as pleasant as possible.

Open House, as this program



is called, is designed to do just that. It is a versatile program that narrows the search quickly and automatically and provides a list of properties that meet exactly the design criteria of the prospective customer.

Before they ever contact a realtor, most people have an idea of what they want in their house. They may like a particular style or desire a particular location. They may need a certain number of bedrooms. Perhaps they want a fireplace for those cold winter evenings or a game room for holiday parties. Maybe they even want a swimming pool for their growing children. In any case, the price range is usually well defined. At this point, a realtor can be of tremendous help.

Real estate brokers, agents and salesmen usually belong to multiple listing boards that provide their members with basic information and pictures of properties for sale in the surrounding area. In my area, the multiple listing books contain properties for sale divided into various categories such as residential, multiple unit dwellings, lots and acreage, commercial and farms. Each property, no matter which category it is in, is given a district number from one to 12 based upon its location.

Although the multiple listing service gives details on all properties, a realtor may still have to review a number of listings to find a house suiting his customer's wants and needs, and in the end may not find a house, simply because it was somehow overlooked.

Open House is an interactive program that asks the buyer general questions about the desired property (see Fig. 1). Should there be no customer requirements in a particular category, that category is simply skipped by depressing the "Return" key.

When the questions have been completed, a printout of the proposed criteria and a listing of all properties meeting that criteria will be displayed or printed (see Figs. 2a-2f), and the agent can then call out additional details of these selected homes by entering their listing numbers (Figs. 2g-2j). Because numbers are the only required entries, the program is extremely easy to operate.

I purposely kept the program simple for this article, but it could easily be expanded to ask questions in other categories or provide as much detailed property information as desired. It is suited for disk storage because it is essentially an information retrieval system, but data-read statements can be utilized (as shown), provided sufficient memory is available.

Ideally, Open House could be administered by the multiple listing boards with participating brokers connected by time-sharing terminals or subscribing to weekly updated data disks. Currently, the program is set up to be used on an individual basis by enterprising realtors; it displays only the properties listed by the realtor's own firm.

To illustrate the power of this program, I have shown some typical search and sort routines that Open House is able to perform (see Fig. 2 for output): (a) all three-bedroom Cape Cod homes under $45,000; (b) all multiple dwellings under $65,000; (c) all ranch homes in District No. 1 under $40,000; (d) all vacant land over 1/2 acre under $5000; (e) all multiple dwellings with four or more units; (f) all three-bedroom homes in District No. 2 between $30,000 and $40,000.

These, of course, are only a sample. Any combination of multiple category search and sort can be performed since this is not your usual "which is larger (smaller)?" sort.

Data Orientation

The data used was taken from an actual local property listing book. Although all 12 districts were used in the original program, the data has been shortened to the first three districts to conserve article space. Each property listing utilizes two data statements as shown in Fig. 3.

If a property is sold, the two data statements pertaining to that property would be deleted; a new listing using the format in Fig. 3 can be placed anywhere in the program, since the search routine examines every listing sequentially anyway.

Hardware/Software

Although the program was initially designed to run on a Wang 2200 WCS with floppy disk, the search portion has

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PROPERTY CRITERIA
PROPERTY STYLE IS CAPE COD
UPPER PRICE LIMIT IS  45  THOUSAND
NUMBER OF BEDROOMS DESIRED IS  3

NO   5  DIST.NO  1  CAPE COD      3 BEDROOMS   $39,000
VERY LARGE HOUSE

NO  11  DIST.NO  2  CAPE COD      3 BEDROOMS   $22,000
TWO CAR GARAGE

NO  17  DIST.NO  2  CAPE COD      3 BEDROOMS   $23,000
CARPORT,PATIO

NO  26  DIST.NO  1  CAPE COD      3 BEDROOMS   $41,800
LOW TAXES

NO  37  DIST.NO  1  CAPE COD      3 BEDROOMS   $34,500
CLOSE TO SCHOOLS

 5  PROPERTIES FIT THE DESCRIPTION

================================================================
```

Fig. 2a.

```
================================================================

PROPERTY CRITERIA
PROPERTY STYLE IS MULTIPLE
UPPER PRICE LIMIT IS  65  THOUSAND

NO  28  DIST.NO  1  MULTIPLE     6 UNITS      $62,500
ALL MASONRY

NO  29  DIST.NO  2  MULTIPLE     5 UNITS      $48,000
MONEY MAKER

NO  32  DIST.NO  1  MULTIPLE     2 UNITS      $38,900
LARGE

NO  33  DIST.NO  3  MULTIPLE     4 UNITS      $24,000
HANDYMAN SPECIAL

NO  40  DIST.NO  1  MULTIPLE     4 UNITS      $45,000
WILL FINANCE

 5  PROPERTIES FIT THE DESCRIPTION

================================================================
```

Fig. 2b.

```
================================================================

PROPERTY CRITERIA
DISTRICT CODE # IS  1
PROPERTY STYLE IS RANCH
UPPER PRICE LIMIT IS  40  THOUSAND

NO   1  DIST.NO  1  RANCH          3 BEDROOMS    $25,900
GAME ROOM

NO   6  DIST.NO  1  RANCH          5 BEDROOMS    $39,000
FIREPLACE AND GAME ROOM

NO  10  DIST.NO  1  RANCH          2 BEDROOMS    $21,500
HANDYMAN SPECIAL

 3  PROPERTIES FIT THE DESCRIPTION

================================================================
```

Fig. 2c.

```
================================================================

PROPERTY CRITERIA
PROPERTY STYLE IS VACANT
UPPER PRICE LIMIT IS  5  THOUSAND
NUMBER OF ACRES DESIRED IS  .5

NO  30  DIST.NO  3  VACANT      1.50 ACRES        $1,500
ALL UTILITIES

NO  31  DIST.NO  2  VACANT      0.50 ACRES        $4,500
NICE AREA

 2  PROPERTIES FIT THE DESCRIPTION

================================================================
```

Fig. 2d.

```
================================================================

PROPERTY CRITERIA
PROPERTY STYLE IS MULTIPLE
NUMBER OF UNITS DESIRED IS  4

NO  28  DIST.NO  1  MULTIPLE       6 UNITS       $62,500
ALL MASONRY

NO  29  DIST.NO  2  MULTIPLE       5 UNITS       $48,000
MONEY MAKER

NO  33  DIST.NO  3  MULTIPLE       4 UNITS       $24,000
HANDYMAN SPECIAL

NO  36  DIST.NO  3  MULTIPLE       8 UNITS       $74,000
FURNISHED UNITS

NO  40  DIST.NO  1  MULTIPLE       4 UNITS       $45,000
WILL FINANCE

 5  PROPERTIES FIT THE DESCRIPTION

================================================================
```

Fig. 2e.

```
================================================================

PROPERTY CRITERIA
DISTRICT CODE # IS  2
LOWER PRICE LIMIT IS  30  THOUSAND
UPPER PRICE LIMIT IS  40  THOUSAND
NUMBER OF BEDROOMS DESIRED IS  3

NO  13  DIST.NO  2  RANCH          3 BEDROOMS    $35,000
WORKSHOP OVER GARAGE

NO  14  DIST.NO  2  RANCH          3 BEDROOMS    $40,000
COUNTRY KITCHEN

NO  35  DIST.NO  2  SPLIT ENTRY    3 BEDROOMS    $35,000
NICELY LANDSCAPED

 3  PROPERTIES FIT THE DESCRIPTION

================================================================
```

Fig. 2f.

been successfully implemented on an Apple II (w/Applesoft BASIC) and a SOL/North Star Disk/Selecterm system, both courtesy of The Computer Tree, Inc., a local computer store in Endwell NY headed by Dave Casler. Since the Wang BASIC is, no doubt, different than the many others on the market, some statement explanations may be necessary (see the program listing for statement numbers).

```
================================================================

PROPERTY CRITERIA
LISTING NUMBER IS  26

NO  26  DIST.NO  1  CAPE COD       3 BEDROOMS    $41,800
LOW TAXES
ADDRESS- HICKORY ROAD            TAXES-   $450

================================================================
```

Fig. 2g.

```
================================================================

PROPERTY CRITERIA
LISTING NUMBER IS  36

NO  36  DIST.NO  3  MULTIPLE       8 UNITS       $74,000
FURNISHED UNITS
ADDRESS- MAIN STREET             TAXES- $1,462

================================================================
```

Fig. 2h.

```
================================================================

PROPERTY CRITERIA
LISTING NUMBER IS  31

NO  31  DIST.NO  2  VACANT      0.50 ACRES        $4,500
NICE AREA
ADDRESS- ROUTE 79                TAXES-   $147

================================================================
```

Fig. 2i.

```
================================================================

PROPERTY CRITERIA
LISTING NUMBER IS  46

LISTING NUMBER  46  NOT FOUND

================================================================
```

Fig. 2j.

Name	Type	Description
I	Input	Desired listing number
D	Input	Desired district code number
S	Input	Desired property code number
S$	Computed	Property description
L	Input	Lower price limit in thousands
H	Input	Upper price limit in thousands
R	Input	Number of bedrooms, units or acres
I1	Data	Actual listing number
D1	Data	Actual district code number
S1$	Data	Actual property description
P	Data	Actual price
C1$	Data	Actual property remark
C2$	Data	Actual property address
C3	Data	Actual property taxes
X	Computed	Number of qualified listings
N	Temp	Number for underlining

Variable descriptions.

Statement Explanations

Colons indicate multi-statement lines.

The Wang accepts a RETURN as an acceptable input. The Apple II and possibly others can duplicate this by testing for the length of the input and branching if zero.

Line 140 Print hex (03) causes the CRT to clear and the cursor to home in the upper left-hand corner.

The ON statement in line 490 is a conditional GOTO statement. If S + 1 equals the value one, branch to 580; if S + 1 equals the value two, branch to 510; and so forth. With any value of S + 1, the program executes statement 500.

PRINTUSING and the image statement % in lines 1150-1230 allow the designated parameters to be formatted in the printout. Print with tabs could be used to accomplish this task.

SELECT PRINT 005(64) in line 130 assigns the output to occur on the CRT; SELECT PRINT 215(93) in line 710 assigns printing to a hard-copy device. Change these to your system's method of output selection.

Using the program documentation (Fig. 4) and the detailed flowchart (Fig. 5) should enable even the weekend programmer to modify the program to his own version of BASIC.

(House Data)

	Listing No.	Dist. No.	Prop. Code	Price	Bedrooms	Remarks
1660 DATA	16,	2,	"Ranch",	60000,	4,	"Wooded Privacy"

	Address	Taxes
1670 DATA	"S.Morningside Drive",	1320

(Multiple Data)

	Listing No.	Dist. No.	Prop. Code	Price	Units	Remarks
1990 DATA	33,	3,	"Multiple",	24000,	4,	"Handyman Special"

	Address	Taxes
2000 DATA	"Vine Street",	420

(Vacant Land Data)

	Listing No.	Dist. No.	Prop. Code	Price	Acreage	Remarks
2020 DATA	34,	2,	"Vacant",	3500,	0.25,	"Water and Sewer"

	Address	Taxes
2030 DATA	"Willette Park",	104

Fig. 3.

Other Related Uses and Variations

The program could be revised to search for and display the realtor's own listings first and then search for other list-

120-	Dimensions the Alphanumeric Variables.
130-	Selects the CRT for display.
140-	Clears screen, homes cursor.
150-	Sets counter to zero.
160- 190	Sets listing number to zero, displays first question and looks for input, checks if input is zero.
200-	Sets district code # to zero, clears screen, homes cursor.
210- 350	Displays the optional code # and descriptions. This part of the program would be revised for your area.
360- 370	Looks for input of district code # and checks if within acceptable limits.
380-	Sets property code # and property description to zero and blank, clears screen, homes cursor.
390- 470	Displays the optional property code # and descriptions.
480-	Looks for input of property code #.
490- 570	Determines if property code # is within acceptable limits. If OK sets variable S$ to type of property desired.
580-	Sets lower and upper price limits to zero, clears screen, homes cursor.
590- 600	Displays question of lower price limit and looks for input.
610- 620	Displays question of upper price limit and looks for input.
630-	Sets variable R to zero, clears screen, homes cursor.
640- 700	Displays the last question which is dependent upon original input for S and looks for input.
710-	Selects the printer for output.
720-	Prints a line across page for outlining.
730- 850	Prints property criteria. If any of the input variables are zero, that particular criteria designation will not print.
860- 870	Reads data statement I1 and checks for end of data indicator.
880-	Reads the rest of a particular property's data.
890- 900	If listing number input equals data listing number branch to printout sequence. If not go to 860.
920- 930	Reads data statement I1 and checks for end of data indicator.
940-	Reads the rest of a particular property's data.
950- 970	If input D = zero or equal to data D1 then goes to next input check; if not go to 920.
980-1000	If criteria S$ = a space or equal to data S1$ then goes to next input check; if not go to 920.
1010-1030	If input H = zero or equal to or greater than data P then goes to next input check; if not go to 920.
1040-1060	If input L = zero or equal to or less than data P goes to next input check; if not go to 920.
1070-1120	If input R = zero or equal to data R1 in the case of houses, or equal to or less than data R1 in the case of multiple dwellings or vacant land then go to printout of data routine; if not go to 920.
1130-1330	Printout routine.
1340-1350	Place data pointer back to first data and return to beginning of program.
1360-2170	DATA statements.
2180-	End of data indicator.

Fig. 4. Program documentation.

ings if nothing suitable were found.

An agent can give a prospective seller an idea of what his house is worth on the market by displaying a list of similar homes and their asking prices.

An agent dealing in apartments and houses for rent could utilize this program, simply altered, to locate living quarters for people seeking places for rent instead of for sale. The questions would be changed, of course. A broker dealing in both sales and rentals could incorporate both into the same program with the initial question dealing with "Buy or Rent?"

In the February 1978 issue of *Kilobaud*, former Editor John Craig described a prototype graphics board from Vector Graphic, soon to be available, which could enable the computer to display digitized photos of the realtor's listings.

Conclusion

The real estate field up to now has had virtually no need for minicomputers, except for payroll and accounting. Why don't you get this program running and show it to a few realtors. The potential is there. Tap it.■

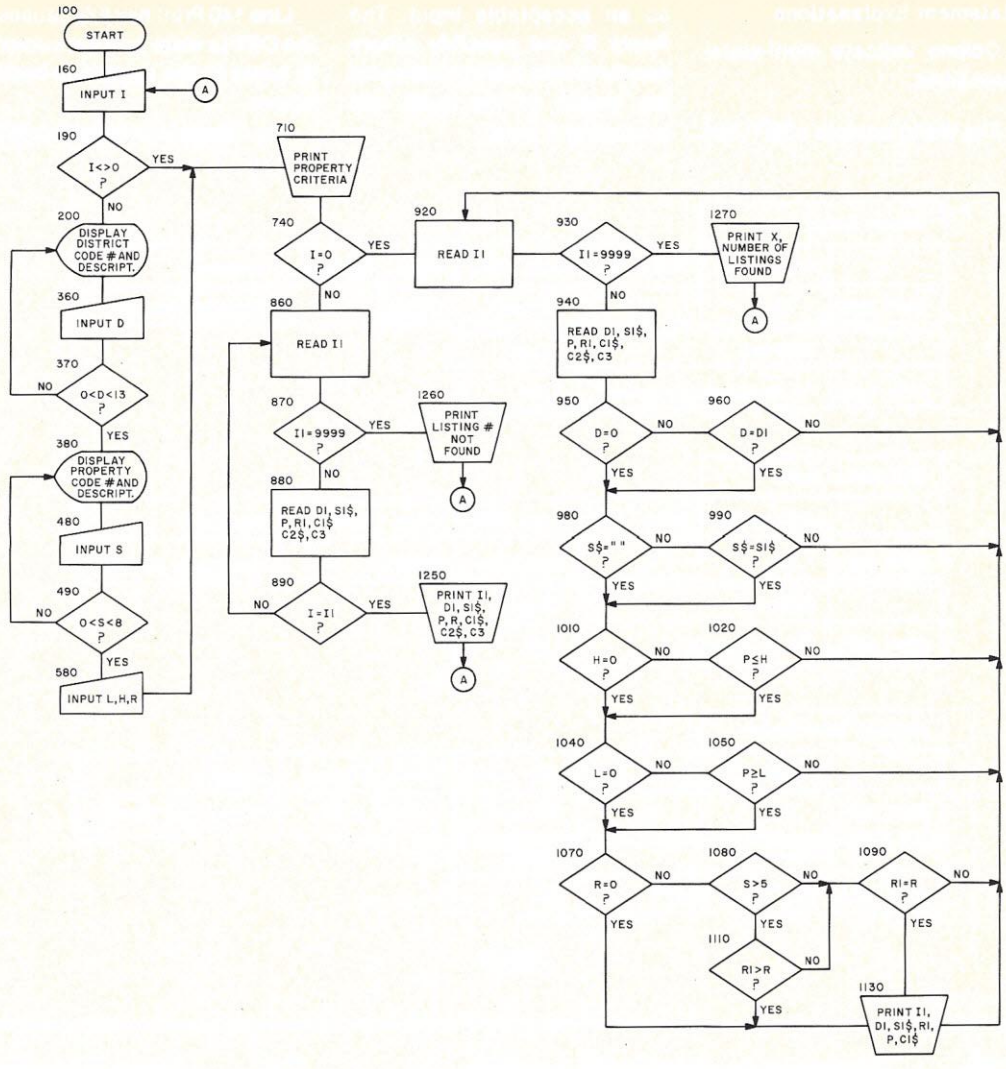

Fig. 5.

Program listing.

```
100 REM - OPEN HOUSE - COPYRIGHT MARCH 1978 BY RICHARD J. NITTO
110 REM - A REAL ESTATE HOUSE SEARCH APPLICATION
120 DIM S$11,C1$64,C2$30
130 SELECT PRINT 005(64)
140 PRINT HEX(03)
150 X=0: REM - SET NUMBER OF QUALIFIED PROPERTIES TO ZERO
160 I=0:PRINT "ENTER THE LISTING NUMBER, IF KNOWN"
170 PRINT "KEY RETURN IF UNKNOWN"
180 INPUT I
190 IF I<>0THEN 710: REM - DETAILS OF A PROPERTY ARE WANTED
200 D=0:PRINT HEX(03)
210 PRINT "ENTER THE DESIRED DISTRICT CODE # OR KEY RETURN TO SKIP"
220 PRINT "CODE # - DESCRIPTION"
230 PRINT "  1   - CHENANGO BRIDGE, PORT DICK, HILLCREST, WHITNEY POINT,"
240 PRINT "        CHENANGO, DICKINSON, FENTON, BARKER, LISLE, TRIANGLE"
250 PRINT "  2   - TOWNS OF CONKLIN, KIRKWOOD, WINDSOR, & COLESVILLE"
260 PRINT "  3   - CITY OF BINGHAMTON, TOWN OF BINGHAMTON"
270 PRINT "  4   - JOHNSON CITY, WESTOVER, FAIRMONT PARK"
280 PRINT "  5   - ENDWELL, ENDICOTT, TOWNS OF MAINE & NANTICOKE"
290 PRINT "  6   - VESTAL"
300 PRINT "  7   - VILLAGE OF OWEGO"
310 PRINT "  8   - SUBURBAN TIOGA COUNTY"
320 PRINT "  9   - TIOGA COUNTY SUBDIVISIONS"
330 PRINT " 10   - CHENANGO COUNTY"
340 PRINT " 11   - STATE OF PENNSYLVANIA"
350 PRINT " 12   - MISCELLANEOUS"
360 INPUT D
370 IF D<0THEN 200:IF D>12THEN 200
380 S=0:S$="":PRINT HEX(03)
390 PRINT "ENTER THE DESIRED PROPERTY CODE # OR KEY RETURN TO SKIP"
400 PRINT "CODE # - DESCRIPTION"
410 PRINT "  1   - RANCH"
420 PRINT "  2   - CAPE COD"
430 PRINT "  3   - TWO STORY"
440 PRINT "  4   - SPLIT LEVEL"
450 PRINT "  5   - SPLIT ENTRY"
460 PRINT "  6   - MULTIPLE"
470 PRINT "  7   - VACANT"
480 INPUT S
490 ON S+1 GOTO 580,510,520,530,540,550,560,570
500 GOTO 380
510 S$="RANCH":GOTO 580
520 S$="CAPE COD":GOTO 580
530 S$="TWO STORY":GOTO 580
540 S$="SPLIT LEVEL":GOTO 580
550 S$="SPLIT ENTRY":GOTO 580
560 S$="MULTIPLE":GOTO 580
570 S$="VACANT":GOTO 580
580 L=0:H=0:PRINT HEX(03)
590 PRINT "ENTER LOWER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP"
600 INPUT L
610 PRINT "ENTER UPPER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP"
620 INPUT H
630 R=0:PRINT HEX(03)
640 PRINT "ENTER NUMBER OF ";
650 ON S-5 GOTO 670,680
660 PRINT "BEDROOMS";:GOTO 690
670 PRINT "UNITS";:GOTO 690
680 PRINT "ACRES";
690 PRINT " DESIRED OR KEY RETURN TO SKIP"
700 INPUT R
710 SELECT PRINT 215(93)
720 FOR N=1TO 64:PRINT "=";:NEXT N
730 PRINT :PRINT :PRINT "PROPERTY CRITERIA"
740 IF I=0THEN 750:PRINT "LISTING NUMBER IS ";I:GOTO 850
750 IF D=0THEN 760:PRINT "DISTRICT CODE # IS ";D
760 IF S$="THEN 770:PRINT "PROPERTY STYLE IS ";S$
```

```
770 IF L=0THEN 780:PRINT "LOWER PRICE LIMIT IS ";L;" THOUSAND"
780 IF H=0THEN 790:PRINT "UPPER PRICE LIMIT IS ";H;" THOUSAND"
790 IF R=0THEN 910:PRINT "NUMBER OF ";
800 ON S-5 GOTO 820,830
810 PRINT "BEDROOMS";:GOTO 840
820 PRINT "UNITS";:GOTO 840
830 PRINT "ACRES";
840 PRINT " DESIRED IS ";R:GOTO 910
850 PRINT
860 READ I1
870 IF I1=9999 THEN 1260
880 READ D1,S1$,P,R1,C1$,C2$,C3
890 IF I=I1 THEN 1250: REM - LISTING NUMBER FOUND
900 GOTO 860
910 PRINT
920 READ I1
930 IF I1=9999THEN 1270
940 READ D1,S1$,P,R1,C1$,C2$,C3
950 IF D=0 THEN 980: REM - LOCATION DOESN'T MATTER
960 IF D=D1 THEN 980: REM - A MATCH
970 GOTO 920
980 IF S$=" " THEN 1010: REM - PROPERTY STYLE UNIMPORTANT
990 IF S$=S1$ THEN 1010: REM - A MATCH
1000 GOTO 920
1010 IF H=0 THEN 1040:REM - NO UPPER LIMIT ON PRICE
1020 IF P<=H*1000 THEN 1040:REM - PRICE WITHIN UPPER LIMIT
1030 GOTO 920
1040 IF L=0 THEN 1070:REM - NO LOWER LIMIT ON PRICE
1050 IF P>=L*1000 THEN 1070: REM - PRICE HIGHER THAN LOWER LIMIT
1060 GOTO 920
1070 IF R=0 THEN 1130: REM - NUMBER OF BEDROOMS,UNITS,OR ACRES DOESN'T MATTER"
1080 IF S>5 THEN 1110
1090 IF R1=R THEN 1130: REM - A MATCH
1100 GOTO 920
1110 IF R1>R THEN 1130: REM - A MATCH
1120 GOTO 1090
1130 GOSUB 1140:GOTO 910
1140 IF S1$="MULTIPLE" THEN 1180
1150 IF S1$="VACANT" THEN 1190
1160 PRINTUSING 1200,I1,D1,S1$,R1,P
1170 PRINTUSING 1230,C1$:X=X+1:RETURN
1180 PRINTUSING 1210,I1,D1,S1$,R1,P:GOTO 1170
1190 PRINTUSING 1220,I1,D1,S1$,R1,P:GOTO 1170
1200 %NO ###  DIST.NO ##  ############   # BEDROOMS  $###,###
1210 %NO ###  DIST.NO ##  #########     ## UNITS     $###,###
1220 %NO ###  DIST.NO ##  ######   ###.## ACRES     $###,###
1230 %##########################################################################
1240 %ADDRESS- ######################  TAXES- $#,###
1250 GOSUB 1140:PRINTUSING 1240,C2$,C3:GOTO 1330
1260 PRINT "LISTING NUMBER ";I;" NOT FOUND":GOTO 1330
1270 IF X=0 THEN 1300
1280 PRINT X;:IF X=1THEN 1310
1290 PRINT " PROPERTIES FIT";:GOTO 1320
1300 PRINT "NO";
1310 PRINT " PROPERTY FITS";
1320 PRINT " THE DESCRIPTION"
1330 PRINT :FOR N=1TO 63:PRINT "=";:NEXT N:PRINT "="
1340 RESTORE
1350 GOTO 130
1360 DATA 1,1,"RANCH",25900,3,"GAME ROOM"
1370 DATA "TRAFFORD ROAD",350
1380 DATA 2,1,"CAPE COD",26000,2,"UPSTAIRS SEMI-FINISHED"
1390 DATA "MARSHMAN ROAD",548
1400 DATA 3,1,"TWO STORY",28900,4,"LARGE YARD"
1410 DATA "FORD HILL ROAD",446
1420 DATA 4,1,"SPLIT ENTRY",36200,4,"2 1/2 BATHS - LR AND DR ARE CARPETED"
1430 DATA "PAMELA DRIVE",554
1440 DATA 5,1,"CAPE COD",39000,3,"VERY LARGE HOUSE"
1450 DATA "RIVERVIEW ROAD",330
1460 DATA 6,1,"RANCH",39000,5,"FIREPLACE AND GAME ROOM"
1470 DATA "ARBUTUS LANE",450
1480 DATA 7,1,"RANCH",54000,4,"ADDITIONAL 4 ACRES AVAILABLE"
1490 DATA "BALLYHACK ROAD",540
1500 DATA 8,1,"RANCH",63000,4,"HEATED POOL AND GREENHOUSE"
1510 DATA "POPLAR HILL ROAD",1200
1520 DATA 9,1,"TWO STORY",78000,5,"TWO FIREPLACES, LARGE POOL"
1530 DATA "COLUMBINE DRIVE",1458
1540 DATA 10,1,"RANCH",21500,2,"HANDYMAN SPECIAL"
1550 DATA "CASTLE CREEK ROAD",300
1560 DATA 11,2,"CAPE COD",22000,3,"TWO CAR GARAGE"
1570 DATA "SANITARIA SPRINGS",347
1580 DATA 12,2,"TWO STORY",28900,3,"FENCED BACK YARD"
1590 DATA "MELODY LANE",546
1600 DATA 13,2,"RANCH",35000,3,"WORKSHOP OVER GARAGE"
1610 DATA "SUNRISE TERRACE",670
1620 DATA 14,2,"RANCH",40000,3,"COUNTRY KITCHEN"
1630 DATA "CONKLIN ROAD",800
1640 DATA 15,2,"SPLIT ENTRY",45000,4,"EXCELLENT VIEW OF CITY"
1650 DATA "ROUTE 7",860
1660 DATA 16,2,"RANCH",60000,4,"WOODED PRIVACY"
1670 DATA "S.MORNINGSIDE DRIVE",1320
1680 DATA 17,2,"CAPE COD",23000,3,"CARPORT,PATIO"
1690 DATA "DYER FLAT ROAD",860
1700 DATA 18,3,"TWO STORY",30000,3,"NEAR SHOPPING MALL"
1710 DATA "ROBINSON STREET",565
1720 DATA 19,3,"RANCH",37000,3,"RECREATION ROOM"
1730 DATA "GRAND BOULEVARD",708
1740 DATA 20,3,"SPLIT LEVEL",43000,4,"LARGE LANDSCAPED LOT"
1750 DATA "MACON STREET",650
1760 DATA 21,3,"RANCH",27500,3,"NEAR HIGH SCHOOL"
1770 DATA "RUGBY ROAD",500
1780 DATA 22,3,"SPLIT ENTRY",39500,3,"LARGE LIVING ROOM"
1790 DATA "MATTHEWS STREET",620
1800 DATA 23,3,"TWO STORY",44500,3,"NEAR MALL"
1810 DATA "RIVERSIDE DRIVE",910
1820 DATA 24,3,"RANCH",24500,3,"LARGE YARD"
1830 DATA "MAIN STREET",650
1840 DATA 25,2,"CAPE COD",43900,4,"AREA OF NICE HOMES"
1850 DATA "PIERCE CREEK ROAD",820
1860 DATA 26,1,"CAPE COD",41800,3,"LOW TAXES"
1870 DATA "HICKORY ROAD",450
1880 DATA 27,1,"SPLIT LEVEL",54000,4,"STONE FIREPLACE"
1890 DATA "CONKLIN FORKS ROAD",1147
1900 DATA 28,1,"MULTIPLE",62500,6,"ALL MASONRY"
1910 DATA "STRATMILL ROAD",1800
1920 DATA 29,2,"MULTIPLE",48000,5,"MONEY MAKER"
1930 DATA "BELDEN HILL",1210
1940 DATA 30,3,"VACANT",1500,1.5,"ALL UTILITIES"
1950 DATA "ATHAN STREET",84
1960 DATA 31,2,"VACANT",4500,0.5,"NICE AREA"
1970 DATA "ROUTE 79",147
1980 DATA 32,1,"MULTIPLE",38900,2,"LARGE"
1990 DATA "MOELLER STREET",622
2000 DATA 33,3,"MULTIPLE",24000,4,"HANDYMAN SPECIAL"
2010 DATA "VINE STREET",420
2020 DATA 34,2,"VACANT",3500,0.25,"WATER AND SEWER"
2030 DATA "WILLETTE PARK",104
2040 DATA 35,2,"SPLIT ENTRY",35000,3,"NICELY LANDSCAPED"
2050 DATA "CHENANGO STREET",872
2060 DATA 36,3,"MULTIPLE",74000,8,"FURNISHED UNITS"
2070 DATA "MAIN STREET",1462
2080 DATA 37,1,"CAPE COD",34500,3,"CLOSE TO SCHOOLS"
2090 DATA "MAPLEWOOD DRIVE",900
2100 DATA 38,3,"RANCH",44500,3,"NICE NEIGHBORHOOD"
2110 DATA "PENNSYLVANIA AVENUE",730
2120 DATA 39,2,"VACANT",8500,2,"VIEW OF CITY"
2130 DATA "UPPER BROAD AVENUE",246
2140 DATA 40,1,"MULTIPLE",45000,4,"WILL FINANCE"
2150 DATA "ROUTE 79",900
2160 DATA 41,1,"VACANT",85000,145,"PLANNED DEVELOPMENT DISTRICT"
2170 DATA "RIVER ROAD",550
2180 DATA 9999
```

Cassette Interfacing: a Multilingual Approach

In the babel of computerdom, the authors suggest building toward a language standard.

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It is no surprise that there are several problems in the microcomputer industry; it is one of the newest and fastest-moving industries in the world. One of the major problems the industry faces is a lack of a universal communication method, i.e., a common language. Although it may be highly improbable that anyone will ever develop the "perfect" language, it does appear that the problem deserves some thought.

In this article we will take a look at some of the "languages" used to communicate between the CPU and a cassette deck. We will also describe a combination hardware/software partial solution to this problem (partial only because there is no total solution as of this writing).

CPU-to-Cassette-Deck Languages

A computer memory typically can hold one or two major programs, and yet a user may, at some time, want to use one of hundreds of programs. The problem then arises, where to store the programs prior to use in a form that is easy to recall and yet, for the cost-conscious hobbyist, is inexpensive. One solution to that problem is storage using the cassette tape recorder.

Using a cassette interface, you can store data serially one bit at a time on cassette tape where it forms a permanent record. This record can be reread and played back into the computer at any time. The cassette tapes are inexpensive, and the performance is reasonably fast. A typical cassette tape recorder can store 500 kilobytes of data on one side of a 60 minute cassette. A typical error-free data transfer rate is 2500 baud, which is 312 bytes per second.

However, there is one glaring problem with cassette data storage. There are at least five popular and separate formats in which data are encoded on cassette tape used by numerous manufacturers. The problem the user faces is how to enable someone to be able to read data information into his computer regardless of his tape language. The five popular formats are: CUTS (used by Processor Technology Corporation), Kansas City, Tarbell biphase, Commodore PET and Radio Shack.

Three formats have become very popular for hobby use: CUTS, Kansas City and Tarbell. Let us define those three formats. (Note: We will discuss data format on tape, not the logical format of the files.)

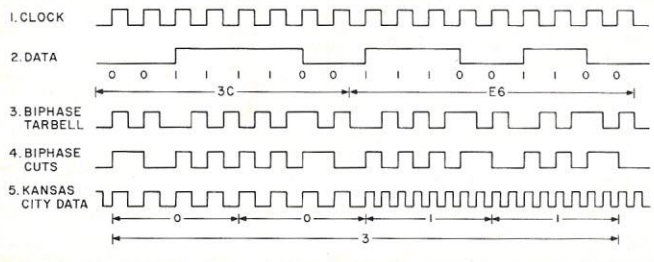


Fig. 1. Basic data encoding.

Data Encoding

To define the three popular formats, we should begin by considering the basic timing diagram outlined in Fig. 1. The top line of that figure is the basic clock frequency. (For our purposes, we will assume that the basic clock frequency is the same for the three methods of encoding, although in practice they will be different.)

The second line of the figure represents the data as they are shifted out of a shift register. Note that the data are shifted on the positive transition of the clock. Zeros are represented by a low level; ones are represented by a high level. As an example of basic data encoding, two hexadecimal bytes are sent to the tape recorder; these bytes are a 3C and an E6.

The third line of the diagram is labeled Biphase Tarbell. Here, note the data are exclusive ORed with the basic clock frequency and then sent to the tape recorder. In this biphase format, a low-frequency pulse indicates a change from a data bit zero to one or from a data bit one to zero. A high-frequency pulse means that the present data bit remains the same as the last data bit. With this method, data inversion is important; the data must be in the correct phase as they are read

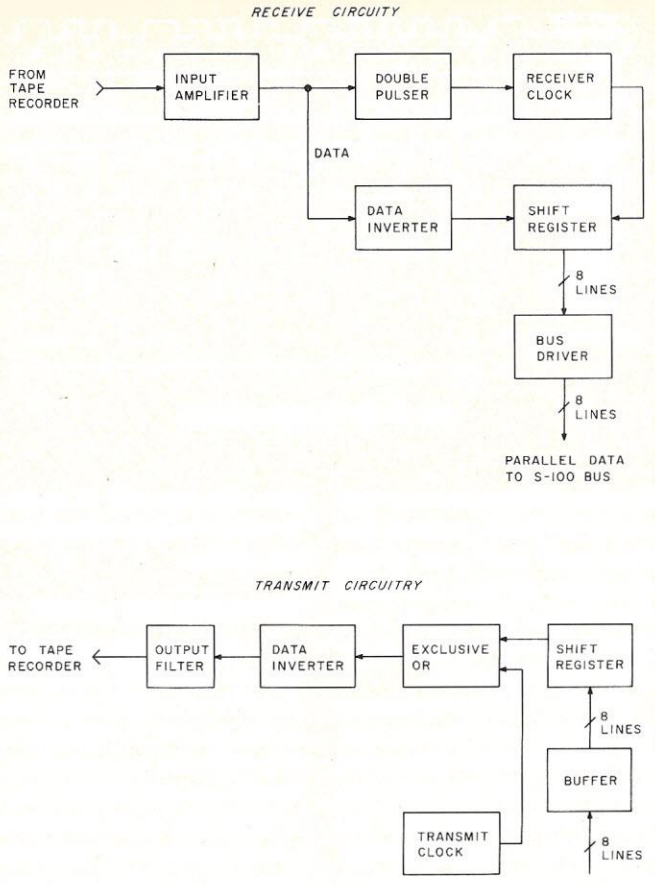


Fig. 2. UCRI simplified block diagram.

into the interface board or they will be incorrect.

Now look at the fourth line of Fig. 1, which is labeled Biphase CUTS. Note that data stored on the tape are represented by either a low-frequency pulse or a high-frequency pulse. A low frequency is always equal to a data bit zero, and a high frequency is always equal to a data bit one. With this method of biphase encoding, data inversion is not important; the data may be reversed coming from the cassette recorder and the interface will still recognize the correct data.

Now consider the Kansas City method of recording. A group of microcomputer manufacturers met in Kansas City and defined that standard as follows: Eight cycles of a 2400 Hz tone represent a data bit one; four cycles of a 1200 Hz tone represent a data bit zero. Kansas City is thus a frequency shift keying method similar to that used in telephone modems.

With Kansas City we are not worried about data inversion; however, it is limited in speed. Even though the basic clock frequency is 2400 Hz, the information transfer rate can never exceed 300 baud. This is because each bit of data requires either eight cycles of a 2400 Hz tone (which equals 300 baud) or four cycles of a 1200 Hz tone (which is also 300 baud).

On line 5 of Fig. 1, the Kansas City data, there are four bits represented: two zeros followed by two ones. Note that each zero is four cycles of a lower frequency, while each one is eight cycles of a higher frequency.

In the two biphase methods of data encoding, 16 bits of information were transferred in the time required to transfer four bits of information in Kansas City. Thus, by their very nature, biphase tape-recording methods are a factor of four to eight times faster than Kansas City. This amount of time becomes important when large blocks of data such as a 16K byte program written in BASIC are handled.

With the CUTS method of recording, this program would require 150 seconds to load into the computer; with the Tarbell biphase method of recording (at Tarbell's standard speed of 1500 baud), this program would require 87 seconds to load, whereas with Kansas City this program would take 601 seconds to load—more than 10 minutes!

If we run the biphase methods of encoding at the same frequency as Kansas City (i.e., 2400 Hz), the time required to load the 16K byte program will reduce to 75 seconds for the CUTS method of encoding and to 55 seconds with the Tarbell biphase method of recording. Time notwithstanding, the problem for the user is how to load software when he has no choice of encoding format. Not all of the software will be in the Tarbell format, nor will all of it be in the CUTS or Kansas City formats.

Ideally the solution is for every manufacturer of software to write it in one standard format. However, that is not the case and probably won't be for a while; therefore, we need an interim solution.

One solution is to use an interface that can read the three formats and interpret them in software to read what is actually represented on the tape. To do this, we will use a Teletek UCRI (universal cassette recorder interface), which is basically a biphase Tarbell-encoding interface. We will describe software that can interpret what the UCRI reads from the tape to determine what data were actually represented.

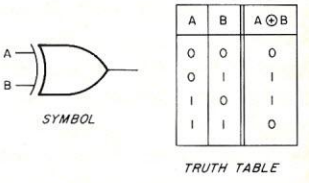
The UCRI

First, let's describe the UCRI and its biphase function. Refer to Fig. 2, a simplified block diagram of the UCRI. This block diagram outlines those major areas of the interface that are required to convert parallel data from the computer into data that can be written to the tape recorder and, on the receive side, take the data from the tape recorder and convert it back to parallel data for the computer.

To understand the functioning of the UCRI, you must understand the method used to assemble data into a format compatible with the tape recorder. Parallel data from the computer are sent via the S-100 bus to the input buffer of the UCRI. From the buffer, they are loaded into an 8-bit shift register. The data are shifted out of this register and exclusive ORed with a transmit clock. The data, as they are shifted out of the register, are illustrated in line 2 of Fig. 1. Data are shifted on the positive edge of the clock.

As you can see, the first two data bits are zeros, followed by ones. The data, after being exclusive ORed, are represented in line 3. (In Fig. 3 the exclusive OR function is illustrated. When both inputs are zeros or both inputs are ones, the output of the exclusive OR gate is a zero. When one input is a one and the other is a zero, the output of the gate is a one.)

Now compare the clock and the data with the exclusive OR function to see how the biphase data are generated. Depending upon the tape recorder being used, the data from the exclusive OR gate may be sent through an inverter. (This compensates for some tape recorders' input amplifiers' inversion of signal.) The data then pass through an output filter that suppresses the harmonics generated in the digital circuitry and are then fed to the tape recorder for recording onto tape.



A	B	A⊕B
0	0	0
0	1	1
1	0	1
1	1	0

TRUTH TABLE

Fig. 3. Exclusive OR function.

Data Recovery

To understand the data recovery from the tape recorder, refer to Fig. 4, the first line of which represents the data as they are received from the tape recorder. The second line represents the actual data that were recorded onto the tape. (These

data are the same as those represented in Fig. 1.)

In Fig. 2, the data from the tape recorder are fed to an input amplifier where they are filtered and squared prior to insertion into the digital circuitry on board. The data then pass to a double pulser and to a data inverter. The output of the double pulser triggers an internal clock, which, when it has finished its timing sequence, clocks data into the shift register.

In Fig. 4, line 3, the output of the double pulser occurs every time the data change from a zero to a one or from a one to a zero. Look at line 4 of Fig. 4, which is the reconstructed clock. Prior to the first data change from a zero to a one on the receive data, the clock was not locked to the incoming data stream. After this initial change, the clock is locked and there is a regular clock generated, which is locked to the received data.

This self-clocking feature allows the tape speed to vary up to 33 percent without affecting the quality of the data. The clock period is set at precisely 75 percent of the duration of one data bit cell. (A bit cell is the time period in which a data bit is determined to be a one or a zero. For the biphase methods discussed here, the time is one cycle of the basic clock frequency.) When the clock returns to logic level zero, the data present at the output of the data inverter are shifted into the receiver/shift register.

Line 5 represents the data that are shifted to the register. These data are incorrect; they are not the actual data that were on the tape. In line 6, we have caused the data inverter on board the UCRI to invert the data that were received from the recorder; in line 7, the data that are now shifted into the shift register are the actual data present on the tape.

Note that when there is a long pulse, the data will change in value from the previous data bit entered into the shift register; when there is a short pulse, the data remain the same. This is important when considering the software (described later) that will interpret other formats.

With a basic understanding of the functioning of the UCRI, we will now look at what happens when various formats other than biphase Tarbell are read from the tape recorder. First, the UCRI is set to 1200 baud, the standard CUTS transfer rate (refer to Fig. 5). The data from the recorder are represented on line 1, and the actual data that they represent are shown on line 2.

The UCRI double pulser synchronizes the receiver clock, which then clocks data into the UCRI shift register. Notice, in particular, those data that are shifted into the register. They bear slight resemblance to the actual data on tape. We must use the Tarbell biphase definition of data in our interpretation of what the shift register sees on the tape. Remember that for every long cycle of Tarbell biphase, the data change from a one to a zero or from a zero to a one.

In the CUTS encoding method, one long cycle represents a zero. Look at the data in the shift register and note every time they change. Whenever a data bit changes from a zero to one or vice versa, we know that there must have been a long data pulse on tape. Therefore, every change in data, as it applies to Tarbell biphase, is actually a CUTS zero bit.

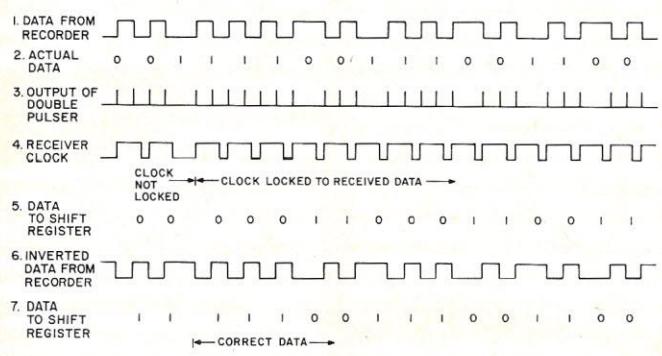


Fig. 4. Data recovery.

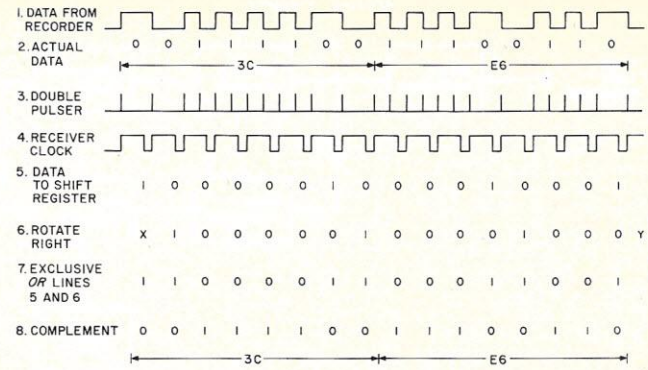


Fig. 5. CUTS data in UCRI.

Software can interpret these changes in data: take the data byte from the shift register and save it. Set the CPU carry flag from the bit shifted out of the last data byte. Get the new data again. Rotate the new data to the right, which rotates the old carry flag in and rotates the new carry flag out. Save the new carry flag. Exclusive OR these rotated data with the original data read in from the shift register and complement them.

Line 6 of Fig. 5 represents the rotated data. The "Y" on line 6 represents the data bit shifted out of the accumulator, which will be saved for the carry flag. The "X" represents the old data bit that was shifted out of the accumulator and is now shifted into the present data byte.

In line 7, exclusive OR the present shifted data with the data as they existed in the shift register. On line 8 we complement the data and see the result is the actual data as they occurred on the tape. In this figure we have used two bytes (16 bits) of data to clarify the process.

In the actual software, the rotating, exclusive OR and complementing will be done one byte at a time. We have changed the data that were in Tarbell biphase into the actual CUTS biphase data bytes. Note that this representation is independent of the phase of the data. The data can be inverted or not; it makes no difference to this routine.

Kansas City Data in UCRI

To interpret Kansas City encoding, the UCRI clock must first be set for 2400 baud (refer to Fig. 6). Line 1 represents the data from the tape recorder in the Kansas City format. Line 2 is what the data represents. Line 3 again shows the double pulser of the UCRI, and line 4 shows the receiver clock response. Line 5 shows the data shifted into the UCRI shift register.

Note that the Kansas City zero appears to the UCRI to be alternating ones and zeros, while the Kansas City one appears to be all zeros. In actual practice, they may be all ones due to a data inversion in the tape recorder. The key here is that alternating ones and zeros represent a Kansas City zero, and when all the bits in the data byte from the UCRI are the same, they represent the Kansas City one.

The software that will interpret these data bits will first mask bits 2 through 5. This is done in case a noise pulse or a lost cycle of Kansas City causes the data to shift slightly. The data, after they are masked, are compared with either a 28 hex or a 14 hex when looking for a Kansas City zero. If neither of those comparisons is good, the bit is assumed to be a one.

One important feature of Tarbell biphase should be mentioned prior to the actual software interpretation of the data on the tape recorder. Tarbell bi-

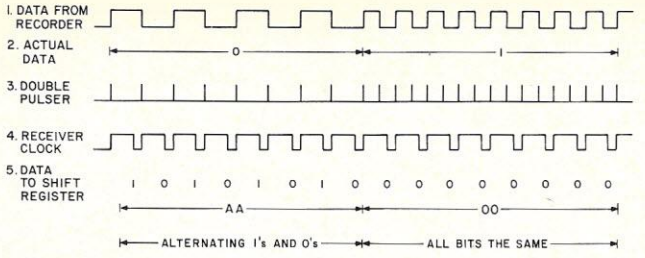


Fig. 6. Kansas City data in UCRI.

phase is a synchronous data transfer method. This means that each data byte is connected immediately to the last data; there are no intervening start or stop bits.

However, CUTS biphase and Kansas City both add a start bit and two stop bits to each data byte. Thus, there will be 11 data bits that must be interpreted for each data byte, while the UCRI will read in only eight bits at a time. The software must then keep track of the data byte that it sees in the UCRI and, additionally, reconstruct both start and stop bits with the data byte in the software.

Wrap-up

As we have seen there is no simple solution to the data transfer problem and there is no interface board currently available that will interface all of the data transfer methods presently being used in S-100 systems. The most capable cassette interface, the Teletek UCRI, speaks three of the languages, Kansas City, CUTS and Tarbell biphase, leaving the Commodore PET and Radio Shack users isolated and unable to communicate with other formats.

There is another possible remedy to the problem, which is beyond the scope of this article: the use of one line of a parallel port for interpretation, disassembly of data bytes for the processor and the assembly and conversion to form those formats from processor data. This approach would emulate some of the system hardware outlined above to effectively solve our problems in a different manner.

The final solution to the problem is the development of a common language so that all users will have the ability to communicate and exchange information. That may be some time off, but we believe that the time is right for the industry to aim in that direction.■

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PET Techniques Explained

Even Commodore will admit that the documentation accompanying many PETs has been rather scant. For those of you who want information on cassette files, read on.

The Commodore PET personal computer has a tape cassette unit that may be used for storage of programs and data. This article explains the basic concepts used to store and retrieve data with the PET and also illustrates some of the hazards (and how to avoid them) likely to be encountered by the novice user.

Getting Started

The first thing that is required is a PET and some suitable tapes. Note that the PET does not use "data" cassettes, such as those used for other types of cassette storage units. Ordinary medium-to-high-quality audio cassettes are used. Cassettes for your audio system are suitable for the PET. Seven or eight blank tapes will be sufficient.

If you want to use the examples that follow, please follow the directions *exactly*. If you take shortcuts, you will usually run head-on into one or another error.

Fig. 1 shows the PET BASIC statements that pertain to data files.

First of all, let's create a data tape. Type in the following program and then RUN it.

```
10  OPEN 1,1,1
20  FOR J = 1 TO 10
30  PRINT#1,J
40  NEXT J
50  CLOSE 1
```

Line 10 opens a data file. The logical file number is 1; the tape drive number is 1; and the I/O option is to write (1). Line 30 does the actual writing on the tape. (Note: Be sure to spell out the word PRINT. Don't use the symbol ? for PRINT—it will leave you with a syntax error in 30). Line 50 closes the file, causing any characters left in the tape buffer to be written onto the tape. (You may want to save this program before using it. If you do so, title it PGM 1.)

When this program is RUN, the PET will give the message:

```
PRESS PLAY & RECORD ON TAPE #1
```

When you do so, PET will respond with:

```
OK
```

And when the program is finished, 'READY.' will appear. Rewind your data cassette and label it DATA 1.

Reading the tape is accomplished with this program.

```
10  OPEN 1
20  FOR J = 1 TO 10
30  INPUT #1, X
40  PRINT X
50  NEXT J
60  CLOSE 1
```

Line 10 opens the file with logical file number 1, and default values of 1 for the tape unit and 0 (read) for the I/O option. Line 30 reads the number on the tape into variable X, and line 40 displays it on the screen.

When you RUN this program, the following should appear on your PET screen.

```
RUN

PRESS PLAY ON TAPE #1
OK
 1
 2
 3
 4
 5
 6
 7
 8
 9
 10

READY.
```

If you cannot get this result, be sure that (1) your programs are *exactly* as shown, (2) you have completely rewound the data tape and (3) your recorder's heads are clean. Take another blank tape and save this program as PGM 2.

To illustrate the storage of strings, change PGM 1 and PGM 2 as follows:

```
PGM 1    30  PRINT#1,"I AM A PET"

PGM 2    30  INPUT#1,X$
         40  PRINT X$
```

If you go through the steps mentioned above when you run PGM 2, your PET screen should show:

```
RUN

PRESS PLAY ON TAPE #1
OK
I AM A PET
I AM A PET
I AM A PET
I AM A PET
I AM A PET
I AM A PET
I AM A PET
I AM A PET
I AM A PET
I AM A PET

READY.
```

Save this data tape as DATA 2.

The third thing to do is very similar, that is, mixing strings and numbers. Take the *original* PGM 1 and PGM 2 and make these changes:

```
PGM 1    35  PRINT#1,"I AM A PET"

PGM 2    35 INPUT#1, X$
         45 PRINT X$
```

Remember that the original lines 30 and 40 are still present this time. Your PET screen should now look like (after running both programs):

```
PRESS PLAY ON TAPE #1
OK
  1
I AM A PET
  2
I AM A PET
  3
I AM A PET
  4
I AM A PET
  5
I AM A PET
  6
I AM A PET
  7
I AM A PET
  8
I AM A PET
  9
I AM A PET
  10
I AM A PET

READY.
```

Save this tape as DATA 3. The purpose of the above examples was to simply show that PET cassette files *do* work.

Some Common Pitfalls

It is, unfortunately, very easy to make errors when working with the PET tape files. Sometimes you will get a syntax error, and other times the PET will "go away" and you will have to

turn off the power and start all over again. Be sure that you have the tapes mentioned in the preceding section.

The "?#" goof. Take PGM 1 and change line 30 by substituting the ? for the

```
PRINT:
30   ?#1, J
```

When you run this program, you will see:

```
?SYNTAX ERROR IN 30
```

Now, do a LIST 30:

```
30   PRINT#1, J
```

Now, why won't that work??? It certainly looks OK. . . .

The secret is that PET BASIC compresses its keywords to one-byte tokens, and expands these when it does the LIST command. The tokens for PRINT and PRINT# are different. Suppose that the tokens are:

```
For ? and PRINT          *
For PRINT#               @
```

When you type in:

```
30   PRINT J
30   PRINT#1, J
30   ?#1, J
```

it becomes:

```
30* J
30@1, J
30*#1, J
```

When BASIC looks at the line 30*#1, J, it assumes that the # is the first variable in the variable list, instead of the logical file number! The tokens * and @ mean very different things to BASIC.

When BASIC does the LIST, it does not care what comes after the keyword. You may have noticed that it is possible to create nonsense programs and LIST them, provided you don't try to run them. BASIC does not check a program line until the line is executed. In any case, the rule is very simple: *Always* spell out "PRINT" in PRINT#.

The , or ; disaster. Take PGM 1 and change line 30 to:

```
30   PRINT#1, J;
```

and run it. Then load PGM 2 and you should see:

```
(Use another blank tape for "scratch" data)
PRESS PLAY ON TAPE #1
OK
 1.23456789E + 11
```

and then, the tape just keeps on going, and going, and ----. When the Stop key is pressed, you will get:

```
BREAK IN 8224
READY.
```

If you try a LIST, the screen fills with many pi (π) symbols, and you have to turn off the power and restart the PET. (Note: This is a little unpredictable, but the general result is the same. . . .)

The best way to see what has happened is to again load PGM 1 and make line 30 not refer to a file (also, remove lines 10 and 50):

```
30   PRINT J;
```

You will see a line of numbers on the PET screen:

```
RUN
 1 2 3 4 5 6 7 8 9 10
READY.
```

Now, change this little program:

```
30   INPUT X
35   PRINT X
```

and run it. When the ? appears for input, type in exactly the same line as was printed above (or, just move the cursor into the line if it is still on the screen). You will see the number 1.23456789E + 10.

What has happened is that the INPUT statement does not see blanks at all, and it absorbes all the digits into one number. The solution is to separate the numbers with commas or carriage returns. If you use commas, you will likely discover the next error.

The no carriage-return disaster. Using PGM 1 again, change line 30 to:

```
30   PRINT#1,J;",";
```

and run it and PGM 2. Everything will proceed normally until a "1" appears on the PET screen. The tape will then keep on turning and will never stop. When you LIST, you will discover that the PET has crashed again. This time, the *first* time INPUT# was used, it read *all* the data on the tape. The second time (J = 2), INPUT# then caused the tape to try and locate another data block. Since there was none, the PET got confused.

The cure to all this is to be sure a carriage return is at the end of each item or group of items read by an INPUT#. Also note that PGM 2 should have been modified to read all ten

OPEN (Logical File Number), (Physical Device Number), (I/O Option), (Filename)
OPEN and the Logical File Number are always required. The other parameters are optional. If they are not specified, a default value is used.

Logical File Number The CLOSE, PRINT, INPUT and GET statements refer to this number to identify which file is being referenced. The value of this number can be from 1 to 255. Up to 10 files may be open at the same time. (If you OPEN to an illegal value, you will get a syntax or illegal quantity error. If you open more than 10 files, your PET will hang up and you will have to turn off the power.)

Physical Device Number This is either 1 or 2, with the default being 1. Number 1 is the cassette mounted in the PET, and number 2 is the auxiliary cassette, which is connected to the PET in the rear and is available from Commodore. Other Device numbers refer to other devices, including the keyboard, CRT and the IEEE-488 bus.

I/O Option Three values are allowed, 0, 1 and 2. The default is 0, which is to read the file. 1 and 2 are for writing. If you use option 2, an "end of tape" marker is written after the file is closed.

Filename This is a string or string variable that identifies the file. Though it can be very long, note that: (1) The default is a null string, which means "anything." (2) Only the first 16 characters are used for identification and (3) If your filename matches the first characters of a longer name, the PET will have "found" the file. (For example, if you open "CAN" and "CANADA" is on the tape, the PET will think that "CANADA" is the correct file.)

If you want to use a parameter which is optional, the preceding parameters must be supplied, even though you are using the default values.

Examples	*Legal*	*Illegal*
	OPEN 1	OPEN,1
	OPEN 23,1,1	OPEN 23,10,1
	OPEN 5,2,0,"SHAZAM"	OPEN 5,2,"SHAZAM"
	OPEN 3,1,1,F$	OPEN F$

CLOSE (Logical File Number)

This closes the file referred to by the Logical File Number. If the file was being written, this forces any characters remaining in the buffer to be written to the tape. If the file was originally opened with I/O Option 2, an "end of tape" marker is also written to the tape.

PRINT# (Logical File Number), (Variable List)

This writes onto the file an *exact* copy of the characters output by an equivalent PRINT statement. This includes graphics, cursor movement, upper/lowercase and carriage-return characters. Care must be taken to ensure that the characters actually written to a file are acceptable by an INPUT# or GET# statement. Note: The form ?# will not work, even though it will LIST as PRINT#. This is explained in the article.

INPUT# (Logical File Number), (Variable List)

The characters on the tape are read in *exactly* the same way the INPUT statement takes characters from the keyboard. All of the limitations of normal INPUT apply to INPUT#. This includes using carriage return and commas to separate numbers, quotation marks to separate strings, and a maximum of 79 characters for any INPUT statement. (If you INPUT# with more than 79 characters on the tape without a carriage return, PET will crash or lose the data. The best approach to this is to PRINT# each item separately to include a carriage return after *each* variable stored on the tape.)

GET# (Logical File Number), (Variable)

This reads one character from the tape in *exactly* the same way that GET reads characters from the keyboard. It is not suggested that you use GET# with a numeric variable!

The 79-character limitation does not apply to GET#. However, be sure of what you are doing!

ST Status Word

This is a special BASIC variable that is set after each I/O operation. Bits are set according to the appropriate I/O conditions that are detected. The BASIC AND operator can be used to determine which bits have been set. The AND masks and conditions are:

4—*Short Block.* When the tape is being read, the block delimiter known as "shorts" is detected instead of data. This might happen if a short program were read as data.

8—*Long Block.* After a buffer full of data was read from the tape, the delimiter ("shorts") was not found. This could happen if a long program were read as data.

16—*Unrecoverable Read Error.* More than 31 errors were found when the data was being read . . . or two errors in the same place in both copies of the data record (PET records the data in each block twice). BASIC will stop with an error message.

32—*Checksum Error.* Checksums are used at the end of each block for both programs and data. If the sum computed from the data read does not match that given from the file, this bit is set.

64—*End of File.* When the end-of-file marker is encountered, this bit is set. Note: Checking this bit is the only way to detect an end-of-file directly. It is suggested you use a flag in the data, or know exactly how much data is on the tape when you read it.

128—*End of Tape.* An "End-of-Tape" marker was found before the file being searched for was found. BASIC will stop with an error message.

Example: To detect an end of file, use a statement similar to:

```
1000   IF (ST)AND 64 THEN PRINT "END OF FILE"
```

Fig. 1. PET BASIC file statements.

data items in the INPUT# statement. To make all this work, try PGM 1 and PGM 2 with these changes:

```
PGM 1    30 PRINT#1,J;",";
         45 PRINT#1
PGM 2    delete 20 and 50
         30 INPUT#1,A,B,C,D,E,F,G,H,I,J
         40 PRINT   A;B;C;D;E;F;G;H;I;J
```

Sure enough, it works!

```
PRESS PLAY ON TAPE #1
OK
 1 2 3 4 5 6 7 8 9 10
READY.
```

The over-80-characters hang-up. If more than 79 characters without a carriage return are written onto a tape, INPUT# will fail. (So will INPUT in normal use if you care to check it out.) Take PGM 1 and PGM 2 and try this combination:

```
PGM 1    30 PRINT#1,"ABCDEFGHIJ";
PGM 2    delete 20 and 50
         30 INPUT#1, X$
         40 PRINT X$
```

The result is shown in Example 1.

When PGM 1 ran, it wrote 100 characters onto the tape. Yet PGM 2 only read 80 of them! In other cases, PET will crash instead (the PET crashed a little while later—always turn off the power if you suspect this kind of error). The rule to follow is: *Always be sure there is a carriage return within each 80 characters of your data tape if you plan to read it with INPUT#.*

How to Avoid the Pitfalls

By now you may have noticed two fundamental characteristics of PET's data tapes.

1. PRINT# writes the *same* characters onto a tape as an equivalent PRINT would have done onto the PET screen.
2. INPUT# expects the *same* characters from the tape as an equivalent INPUT would have from the PET keyboard.

Since PRINT does not include commas between its variables, some care must be taken to ensure that the characters written to the tape will be understood correctly by the INPUT statement. If you fail to take care of this, the penalty is lost data in the lucky case, and a PET crash otherwise. Take heed!

Long Data Files

The preceding examples have always created a tape with fewer than 191 characters on it. This was done deliberately to avoid introducing a complicating factor that will now be illustrated. When the PET writes a long data file, it will often be impossible to read the file back again unless some precautions are taken. (This is an operating system error that Commodore plans to fix someday. However, the fix shown below will work regardless.)

Take PGM 1 and PGM 2 and change line 20 in *both* of them to:

```
20  FOR J = 1 TO 1000
```

When you run PGM 1, notice that the cassette drive turns the tape on and off, pausing at about 7-second intervals. Each time 191 characters are written to the tape, the tape is advanced one block and the characters recorded. The tape drive waits until there are 191 characters for writing.

Now, run your PGM 2 and watch carefully! The numbers 1 to 1000 will roll up the screen, with pauses while the tape turns on and reads the next data block. With my PET, I noticed that there was something amiss . . . the display looked like this:

```
48
49
50
99
100
101
    etc.
```

The numbers 51 through 98 were missing! Also missing were 137-175, 213-251 and so forth. (Your PET may miss different groups of numbers, but the result is the same—PET misses tape blocks when reading from the tape.)

The exact problem has been found out by Commodore, and is beyond the scope of this article. However, a simple "fix" has been found. The way it works is to count the characters being written to the tape, and when more than 191 characters are counted, to turn the tape motor on for a short time, increasing the space between data blocks on the tape.

To verify that the tape is written on after 191 characters are output, try this program.

```
10  OPEN 1,1,1
20  GET A$ : IF A$ = "" THEN 20
30  J = J + 1
40  PRINT J
50  PRINT #1,"X";
60  GO TO 20
```

("" is a null string)

Using a scratch tape, run this program and press keys until you see 190 on the screen. The tape ran for a while when the OPEN statement was executed (this wrote the tape header) and was still while you pressed the keys. When you press again, 191 appears, and the tape remains still. When you press again, 192 appears, and the tape now runs. This means that a block is written to the tape *after* 191 characters have been printed.

Turning the cassette motor on and off is done via the two "black magic" statements (in Example 2). (These manipulate some PET I/O registers.)

To see how this works, here is the "PET Maytag Program" for your enjoyment.

```
10  OPEN 1,1,1
20  POKE 59411,53
30  FOR J = 1 TO 1000: NEXT J
40  POKE 59411,61
50  FOR J = 1 TO 1000: NEXT J
60  GOTO 20
```

Do not put a cassette in the player, and just press "play" when asked to "PRESS PLAY AND RECORD." After a few seconds, the cassette motor will turn on and off every two seconds or so. Those of you with the second cassette unit are invited to make the appropriate changes and try it out on your second cassette.

The Fix

Here is PGM 1 modified to write 1000 numbers with a 10 "Jiffy" motor pulse between tape blocks. Subroutine 1000 is given the number of characters (L) written onto the tape. It checks to see if the total number (CH) is larger than the block size or 191 characters. If the tape has written a block, the motor is turned on for 10/60th of a second, or 10 "jiffies," and then turned off. The total number of characters is updated to show the number in the current block to be written. When this program is used to make a data tape, the previous version of PGM 2 reads all 1000 numbers perfectly.

```
5   REM—FIXED VERSION OF PGM 1
10  OPEN 1,1,1
20  FOR J = 1 TO 1000
30  PRINT #1, J
35  L = LEN(STR$(J)) + 1
36  GOSUB 1000
40  NEXT J
50  CLOSE 1
60  END
1000  REM CASSETTE FIX
1010  CH = CH + L
1020  IF CH < 192 THEN RETURN
1030  TA = TI
1040  POKE 59411,53
1050  IF TI-TA < 10 THEN 1050
1060  POKE 59411,61
1070  CH = CH - 191
1080  RETURN
```

Two things should be noticed. Line 35 computes the

```
PRESS PLAY ON TAPE #1
OK
ABCDEFGHIJABCDEFGHIJABCDEFGHIJABCDEFGHIJ
ABCDEFGHIJABCDEFGHIJABCDEFGHIJABCDEFGHIJ

READY.
```

Example 1.

```
Normal PET Cassette
    Turn ON     POKE 59411,53
    Turn OFF    POKE 59411,61

PET Second Cassette
    Turn ON     POKE 59456, PEEK(59456)OR 16
    Turn OFF    POKE 59456, PEEK(59456)AND 239
(Remember that the second cassette is Physical Device # 2.)
```

Example 2.

```
RUN
BIG BROTHER PROGRAM
SUBJECT'S NAME? BILLY BYTE

PRESS PLAY & RECORD ON TAPE #1
OK
'EXIT' WHEN DONE
? BILLY IS A FINE BOY
? EXIT

SUBJECT'S NAME? JOHN RAM
'EXIT' WHEN DONE
? JOHN IS FORGETFUL
? EXIT

SUBJECT'S NAME? MRS CPU
'EXIT' WHEN DONE
? HAS NICE EYES
? EXIT

SUBJECT'S NAME? QUIT

READY.
```

Fig. 2. Sample run.

length of the number written to the tape *and* the carriage return. Line 1050 is a delay loop using the BASIC timing variable, TI, which counts in 1/60 second intervals.

Using File Names

If you want to put more than one file on a tape or want to use different files for different purposes, the file name lets you tell one file from another.

When the PET opens a file for writing, it puts the file name in the header record (which is written when the OPEN statement is executed). If there was data originally on the tape, the PET will ignore this and write over it.

When the PET opens a file for reading, it reads the header record and compares it with the file name it was told to search for. If the first characters in the name from the tape match the expected name, the PET then reads the file. If not, the PET will search for another header record. Warning: If you plan to have more than one file on a tape, be sure you will read them only. Writing a file between others is hazardous and likely to destroy any following files. It is also difficult to position the tape at the right point.

Here is a somewhat contrived example for multiple files.

```
10  REM CONTRIVED EXAMPLE
20  PRINT "BIG BROTHER PROGRAM"
30  INPUT "SUBJECT'S NAME";N$
40  IF N$ = "QUIT" THEN END
50  OPEN 1,1,1,N$
60  PRINT"'EXIT' WHEN DONE"
70  INPUT D$
80  IF D$ = "EXIT" THEN 110
90  PRINT#1,D$
100  GOTO 70
110  CLOSE 1
120  PRINT
130  GOTO 30
```

The subject's name, N$, is used for the file name. Strings are written onto the file until you enter EXIT. Then the program closes the file and asks for another subject's name. The result is a series of files, one for each subject. Note that if you enter more than a few lines of data, the PET will require the "Jiffy fix" mentioned in the previous section. A sample run of this program is shown in Fig. 2.

Notice that if you have already pressed PLAY & RECORD on the tape unit, the PET will not ask you to do it again. This "convenience" is sometimes a hazard. For example, if you have to rewind a tape, and forget to do it before running your program, you will have to stop the program and start over. The program to read the contrived example's data tape is shown in Fig. 3.

Notice that in line 50 you must include all the parameters in the OPEN statement. In line 70, the semicolon is not required between the quote mark and N$. PET BASIC permits this provided it is clear what the variables are. Line 90 checks the I/O status variable, ST, for any unusual condition (in this case, the intention is to find the end of file); if any is found, the program closes the file and asks for the next name. When using ST in this way, the test must be done *immediately* after the I/O operation. When run, the PET screen will look like this:

```
RUN
BIG BROTHER'S BROTHER PGM
SUBJECT'S NAME? JOHN RAM

PRESS PLAY ON TAPE #1
OK

THE SCOOP ON JOHN RAM
JOHN IS FORGETFUL

SUBJECT'S NAME
```

Notice that the first file, "BILLY BYTE," was ignored, and the PET found the second file, "JOHN RAM." Naturally you will have to rewind the tape if you want to find a file you have already read past.

Try it again, using "BILL" as the subject's name.

```
RUN
BIG BROTHER'S BROTHER PGM
SUBJECT'S NAME? BILL

PRESS PLAY ON TAPE #1
OK

THE SCOOP ON BILL
BILLY IS A FINE BOY

SUBJECT'S NAME?
```

PET found the file "BILLY BYTE," which matched "BILL" in the first characters. This illustrates that some caution is required in choosing file names so that their names do not fit inside each other.

Using GET# with Files

The GET# statement comes in two flavors: one for numeric variables, and the other for strings. GET# with numeric variables is very difficult to use because it permits only the characters 0-9, +, −, ., E and space. Try the following program and you will find out that illegal characters give syntax errors, without any indication of why.

```
10  GET X : PRINT X;: GOTO 10
```

For this reason, only GET# for strings will be discussed.

First of all, GET# may be used to read any data on a file in string form. Here is a program that reads any tape and displays its contents.

```
10  OPEN 1
20  GET#1,A$
```

```
 10  REM·TAPE TRACER
 20  REM BY GREGORY YOB APRIL 1978
 30  REM AVAILABLE FROM:
 40  REM MIND'S EYE PERSONAL SOFTWARE
 50  REM PO BOX 354, PALO ALTO, CA 94301
 60  PRINT"♥ TAPE TRACER                (the ♥ symbol is clear screen)
 70  PRINT
 80  PRINT"PUT YOUR DATA TAPE IN TAPE#1 AND
 90  PRINT "REWIND IT.
100  PRINT "        PRESS ANY KEY WHEN YOU ARE READY
110  GET A$ : IF A$ = "" THEN 110        ("" is a null string)
120  OPEN 1
130  PRINT "♥ ";      (clear screen again)
140  B = B + 1
150  PRINT "BLOCK NUMBER : ";B
160  PRINT
170  FOR J = 1 TO 191
180  GET#1, X$
190  IF ST > 0 THEN 500
200  IF ASC(X$) = 13 THEN PRINT "RX  ";: GOTO 220      (Rvs ON, Shift-V, Rvs OFF)
210  PRINT X$;
220  NEXT J
230  PRINT:PRINT:PRINT
240  PRINT "MORE? ";
250  GET A$: IF A$ = "" THEN 250          (null string again)
260  IF A$<> "N" THEN PRINT : GOTO 140
270  CLOSE 1
280  END
500  PRINT:PRINT:PRINT:PRINT"STATUS WORD : "ST:PRINT
510  IF(ST)AND 4 THEN PRINT"SHORT BLOCK
520  IF(ST)AND 8 THEN PRINT"LONG BLOCK
530  IF(ST)AND 16 THEN PRINT"READ ERROR
540  IF(ST)AND 32 THEN PRINT"CHECKSUM ERROR
550  IF(ST)AND 64 THEN PRINT"END OF FILE
560  IF(ST)AND 128 THEN PRINT"END OF TAPE
570  END
```

Note that a trailing quotation mark is not needed at the end of a PRINT statement.

When this program is run using DATA 1, the PET screen should show (Note: X is used to show the shift-V graphics character):

```
First,
TAPE TRACER
PUT YOUR DATA TAPE IN TAPE# 1 AND REWIND IT.
    PRESS ANY KEY WHEN YOU ARE READY
PRESS PLAY ON TAPE #1
Then,
BLOCK NUMBER : 1
 1X 2X 3X 4X 5X 6X 7X 8X 9X 10X
STATUS WORD: 64
END OF FILE
READY.
```

If the data tape with the 1000 numbers on it is used, you will see:

```
BLOCK NUMBER : 1
 1X 2X 3X 4X 5X 6X 7X 8X 9X 10X 11X 12X
13X 14X 15X 16X 17X 18X 19X 20X 21X 22X
23X 24X 25X 26X 27X 28X 29X 30X 31X 32X
33X 34X 35X 36X 37X 38X 39X 40X 41X 42X
43X 44X 45X 46X 47X 48X 49X 50X
MORE?
```

If you press any key except "N", you will then see the next block of numbers and so on. Try this program with your other data tapes.

Program listing.

```
30  PRINT A$;
40  GOTO 20
```

Try it with the DATA 1 tape:

```
RUN
PRESS PLAY ON TAPE #1
OK
 1
 2
 3
 4
 5
 6
 7
 8
 9
 10
1

(the tape keeps on going)
```

The extra 1 is part of the end-of-file marker. This program just keeps on reading tape until it is stopped, for it ignores the ST variable unless you explicitly check for it. To do that, add these two lines:

```
25  IF ST>0 THEN 50
50  CLOSE 1
```

(Warning! Restart your PET—*any* time you interrupt tape I/O you run the hazard of crashing shortly after, which happened to me after doing the preceding example and then trying this one.) Now the DATA 1 tape will be read and shown correctly. Try the other tapes you have and see what is on them.

A Final Pitfall

Sometimes you will have a program that you know works fine with data tapes, and yet the tape drive never stops turning. There are two possibilities: (1) You never rewound your data tape and (2) Your tape being read is a program tape, not data. Though it seems obvious that such simple mistakes can easily be detected, you will find yourself being caught!

A Useful Program

When tracking down difficult tape file problems, the program listing can be of some assistance. It reads your data tape, a block at a time, and shows the characters on the screen for your inspection. To indicate carriage returns, a reverse field "X" (Shift-V graphics character) is shown instead. As this program is intended for normal alphanumeric data, no provisions are made for graphics or cursor-control characters. That is an exercise for you, the bold programmer.

When you finish typing the program in, be sure to LIST it and check its accuracy. ■

```
10  REM READING EXAMPLE
20  PRINT "BIG BROTHER'S PGM"
30  INPUT "SUBJECT'S NAME";N$
40  IF N$ = "QUIT" THEN END
50  OPEN 1,1,0,N$
60  PRINT
70  PRINT" THE SCOOP ON "N$
80  INPUT#1, D$
90  IF ST <> 0 THEN 110
100  PRINT D$ : GOTO 80
110  CLOSE 1
120  PRINT
130  GOTO 30
```

Fig. 3.

Reader Service—see page 147

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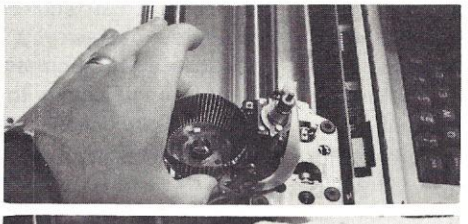

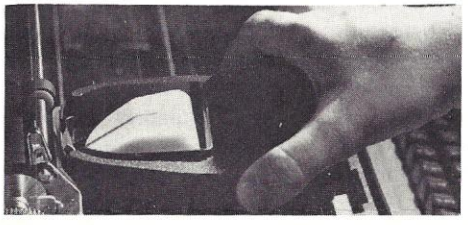

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✓ Reader Service—see page 147

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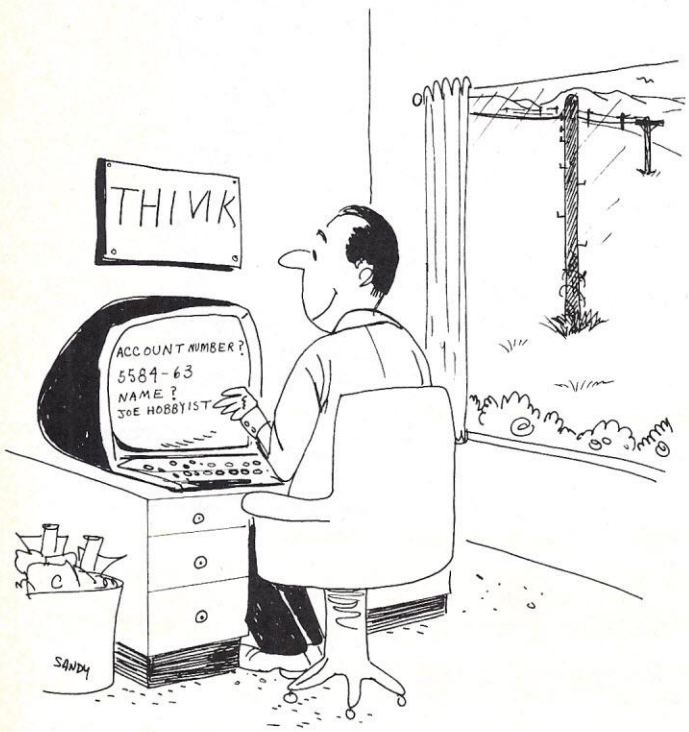
Mt. Kisco NY 10549

A Service Bureau for Hobbyists

Where should hobbyists who want to find out about establishing service bureaus turn? Through the pages of this article, for starters.



A service bureau is a company that uses its computer equipment to do work for other people. In the commercial data-processing world, service bureaus have been around for years.

What They Do

Commercial service bureaus work in various ways. Some customers may have their own programming personnel and just rent time on a service bureau's computer rather than buy their own. Other customers may simply send their data to a service bureau and let the bureau do all the programming as well as the actual computing (i.e., a doctor or dentist who simply fills out a short form for every patient, and then sends it to his service bureau, which processes the information to prepare bills and record payments). This kind of customer lets the service bureau do all his work.

Still other customers use a service bureau as an extension of their own computer installation. Sometimes the service bureau handles only the occasional overflow that the customer does not have time for on his own machine—a common situation. If the customer's own machine breaks down, he can then send everything to the service bureau until repairs are made.

At times, the service bureau is used only to supply specialized services, such as a particular output device (e.g., a local telephone company that maintains its own computerized list of customers, and once a year goes to an outside service bureau that has a computer-controlled typesetting machine to produce a telephone directory). This last kind of customer uses a service bureau only for the occasional job his own computer cannot handle.

What They Could Do for the Hobbyist

Obviously, computer hobbyists and other small-computer users fall into the same category and have the same problems. Occasionally they want to do something which their own equipment, no matter how large or complex, cannot handle. This article is a description of some services we small-computer users could use from a service bureau, and a proposal that someone, somewhere, might find attractive enough to establish a service bureau just for us.

At the outset, let's understand that small-computer users and hobbyists are very price-conscious; so above all, a service bureau for hobbyists has to inexpensive. The only way to keep prices low is through volume and standardization; performing only standard services which can be used by a lot of people. This means that the service bureau has to keep away from custom work—no programming of special jobs for customers.

What kinds of services can be used by many people? They fall into several categories:

1. More computing power. This can mean either faster computing or being able to run bigger programs. In general, hobbyists can afford to wait a little longer, so speed should not be too important. But being able to run bigger programs—do bigger jobs—can often be useful. No matter how much memory you have, there always comes a time when you think of a program that requires more. That seems to be a law of nature.

There are some jobs that, though simple, can require a lot of memory unless you use disks or cassette recorders and complex programming to get around it. For example, sorting a big list of names or numbers into order is easy if you have enough memory to store the entire list at one time. It can also be done on disk or cassettes, if you know how and spend the time to prepare the program, but may take much longer. In some cases, the same list may have to be sorted several times into different lists. For example, a mailing list may have to

be sorted into order by name, perhaps by account number, and even by zip code if you intend to mail second-class. A few hundred names may take more memory than the average hobbyist has.

A service bureau could receive a file of data with sorting directions, and a day or two later it would be returned sorted. There are other service-bureau applications, including running large BASIC programs, assembling and disassembling programs and doing other jobs that require more memory than you have. To make a job economical, the service bureau may have to set up a data-acceptance format—perhaps a cassette recorded in a specific way. More on data formats later.

2. Data or format conversion. Frequently a program you want is available on a Kansas City format cassette you can't read because you have a Tarbell cassette interface . . . or it may be formatted for an Altair 6800 system, and you have an SWTP 6800 system with a different monitor . . . or perhaps you have a cassette recorded at 1200 baud but can only read 300 baud. There are currently many incompatible data and format standards; it would be handy if a service bureau could translate from one to another.

3. Language conversion. We have already mentioned assembling and disassembling, but there are other possible translations. For example, conversion of programs from FORTRAN to BASIC is not easy, but it could be done.

4. Additional input or output devices. Some input or output devices are cheap: almost every system has a keyboard, many have some kind of video output, and even inexpensive Proko or Oliver Audio Engineering paper-tape readers are available. But how many of us have a good printer, a punched-card reader, a paper-tape punch or a good plotter for drawing pictures? Wouldn't it be nice to prepare an article using your text editor, and then send your edited data to a service bureau and have the bureau return a neatly typed copy prepared on a Selectric typewriter controlled by the bureau's computer? How about sending a cassette tape of a program, and getting back a printed listing as well as a paper tape? In this way a service bureau could act as an extension of your computer.

How? Standardization

Now, how might something like this be arranged? There are two things to worry about—how to send data back and forth, and how to arrange payment. The payment problem could be resolved by having an account with a service bureau or sending payment with the order; so let's discuss how to send data back and forth.

For some applications the answer is obvious. If you want a cassette changed from Tarbell to Kansas City format, for instance, you simply send it back and forth by mail. Mail service these days is usually fast enough to get your tape back within a week or less.

For other applications, the answer is less clear. Suppose you want a data file sorted. Do you send a cassette tape? What kind? How fast? Or would a paper tape be better? You can't expect a service bureau to read any kind of tape, at any speed, in any format. Some kind of standardization, as well as a system that will allow the service bureau to read your data without error, is necessary. The Kansas City standard would probably be the best choice if cassettes are used, though paper tape or some other medium might be as good. Floppy disks, on the other hand, require careful adjustment; and there might be problems with writing a floppy on one drive and reading on another.

Furthermore, to keep costs low, it will be necessary for the service bureau to specify exactly how the data is to be formatted and recorded on your tape. You would have to adapt to the bureau's requirements as they apply to the header information and other formatting of the tape. For the service to be inexpensive, you must provide the input in such a way that the service bureau can put it on a computer and immediately process it. You can't expect the bureau to search your cassette, for example, to find the beginning and end of data.

Sending data by telephone effects fast turnaround. As long as you keep the call short or make it after 11 PM or before 8 AM, it need not be expensive. Better yet, the service bureau might have a toll-free number. Many companies have such a number for other use during the day; there is no reason why hobbyists could not use it at night.

Data transmission by telephone is ideal for many of the things a hobbyist might need. For example, if you needed a printout or paper tape of a program you could call the service bureau at night. Their automatic equipment could answer your call, check that your name or account number was on their list of known customers, and record your data. The next morning the printout or paper tape of your program could be in the mail for delivery a day or two later. If we are going to use phone lines to transmit data, it might be convenient to adopt the same standards that are used by time-sharing computer services. This involves the use of modems and, possibly, acoustic couplers.

Using Modems

In time-sharing systems, data is usually sent between a central computer and a remote teletypewriter or CRT terminal using serial ASCII code at either the standard 110-baud teletypewriter speed, or at 300 baud. The conversion between digital data and the audio tones that are sent over the telephone lines is performed by a modulator-demodulator circuit called a *modem*. The modem can either be connected directly to the phone line (through a phone-company-supplied "protective network" called a Data Access Arrangement) or coupled acoustically into the telephone handset. The acoustic coupler usually has the modem built into it. One such acoustic coupler, available in many computer stores, is the Pennywhistle (described in the March 1976 issue of *Popular Electronics*). Used acoustic couplers are often advertised in the back pages of *Kilobaud*.

Two modems are always

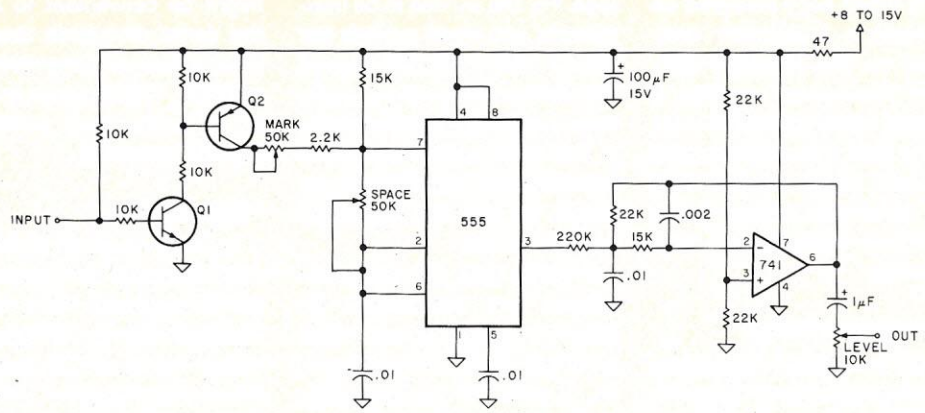


Fig. 1. FSK modulator no. 1.

used, one at each end of the telephone line. Each modem generates a pair of audio tones and receives a different pair, with the modems arranged so that the pair of tones generated by one modem is received by the other. The reason for using different pairs of frequencies to send and receive is to permit data to go in both directions at the same time without interference. To avoid the mess that might result if both modems sent or received the same frequency tones, one of the two is called the *originate* modem; the other is called the *answer* modem. There is a slight difference in construction between the two.

The frequencies used are the following: Transmission from the originate modem to the answer modem uses 1270 Hz for a digital 1 and 1070 Hz for a digital 0. Transmission from the answer modem to the originate modem uses 2225 Hz for a digital 1 and 2025 Hz for a 0. As the digital ones and zeros are sent out one after another, the tone shifts in frequency between the higher or lower frequency of each pair. This is called *frequency shift keying* or FSK. This choice of modulation and frequencies dates back to a Bell model 103A data telephone introduced earlier by the phone companies. It is often called *Bell 103A compatible.*

In standard time-sharing, the teletypewriter machine or CRT terminal and its modem usually call the central computer, and thus use an originate modem sending out 1270 and 1070 Hz. The central computer has an answer modem that sends out 2225 and 2025 Hz. (In specific cases the situation could be reversed.) Most modems are capable of being answer modems or originate modems, but not both. The Pennywhistle or other generally available acoustic couplers are originate modems—they can communicate with an answer modem but not with each other.

It now becomes obvious that there are advantages to adopting the same method for communication with service bureaus. You would, of course, have an originate modem to call the answer modem connected to the central computer at the service bureau. You could either have a modem connected directly to telephone circuitry, or you could use an acoustic coupler.

Until service bureaus for hobbyists become available, there is a simple way to experiment with telephone transmission of data. Many companies and schools already have a computer terminal of some kind with an acoustic coupler—usually a Teletype or some other kind of teletypewriter or CRT terminal. Many are equipped with a paper-tape punch. If you have access to one of these machines, you could send some data to it over the phone and get printed listings or punched paper tape output. Since that terminal will probably have an originate modem or acoustic coupler, you will need an answer modem or coupler to communicate with it. (This does not necessarily mean the call has to be placed from the other end—you can call either way as long as there are two different kinds of modems at the two ends.)

Answer modems are much less common than originate modems, so they're more expensive. There are other ways to acquire them. You could try to modify the Pennywhistle circuit or build your own. For example, Motorola makes an MC6860 integrated circuit specially designed for making modems, and Motorola's application note AN747 adequately describes the circuitry needed. "An excellent article by Ron Lange on building a modem with the Motorola MC14412 appeared in *Kilobaud* No. 11 (November 1977); by the throw of a switch, this modem can be used as either an originate modem or an answer modem."

It is much easier, however, to build only half of an answer modem—the half that sends. In this way, you will be able to generate the 2025 and 2225 Hz tones you need to send data to the originate modem, but will not be able to receive. This will still enable you to send data out and have it printed, and perhaps even punched, at the other end.

If you already have a cassette interface that can store data on the cassette as ASCII characters at 110 or 300 baud with start and stop bits, you might add some extra circuitry to switch-select the new frequencies of 2225 Hz for a 1 and 2025 Hz for a 0. In most cases, all that is needed is a DPDT switch and two potentiometers for adjustment.

If you do not have such an interface, it is fairly easy to build an FSK oscillator that will shift back and forth between 2225 and 2025 Hz to generate the right tones. First, you need a serial output from your computer to send out Teletype-compatible serial ASCII code. Although you could get a UART interface that generates the required code directly, you can also use one of the bits on an output port and use software to generate the required serial output. Once you have the ASCII code, the circuit of either Fig. 1 or Fig. 2 will generate the right tones for you.

Fig. 1 is more complicated but has the advantage of using readily available parts that you may already have in your junk box; in any case, they are available at Radio Shack. In this circuit, a 555 timer IC generates a

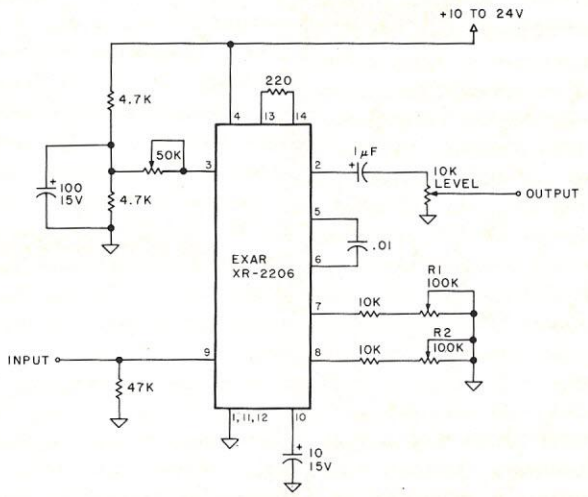


Fig. 2. FSK modulator no. 2.

square wave at the proper frequency, while an active low-pass filter using a 741 op amp removes the harmonics and converts the square wave to a fairly good approximation of a sine wave. Any common low-power silicon NPN and PNP transistors may be used for Q1 and Q2, respectively.

The circuit is set up so that a low or ground input generates the space or 0 tone of 2025 Hz, whereas a high or open input generates the mark or 1 tone of 2225 Hz. When the input is grounded, both Q1 and Q2 are off, and the MARK potentiometer is not used. At this point, the SPACE pot should be adjusted for an output frequency of 2025 Hz with a frequency counter connected to pin 6 of the 741 amplifier (which can be replaced with a 5558, 1458, 748 or other op amp as long as the right pin connections are used). Once the SPACE pot is adjusted, make the input open-circuit and adjust the MARK pot for a frequency of 2225 Hz. The adjustment of the LEVEL pot depends on your use.

To tape the output, use the AUX input on the cassette recorder if one is available; the MIKE input can be used, but avoid setting the level too high. If you are going to couple the tones to the telephone line, acoustic coupling to the mike of the handset is possible using a small high-impedance earphone to generate the sound. Direct electrical connection to the telephone line, while technically feasible and even preferable, is frowned on by Ma Bell.

Fig. 2 shows an alternative circuit. Though simpler, it requires a special Exar XR-2206 function generator IC. This IC can directly generate a fairly clean sine wave with the circuit shown; the 50k pot connected to pin 3 should be adjusted for the least distortion. The frequency of the output is set by the 0.01 uF capacitor connected between pins 5 and 6, as well as the resistance connected to either pin 7 or pin 8, depending on the input to pin 9. If pin 9 is ground or low, pot R2 sets the frequency; if pin 9 is high, pot R1 sets the frequency. Hence, the frequency can easily be shifted by applying the digital data directly to pin 9. Simply decide whether your available data has its high input level representing 0 or 1, and then adjust R1 and R2 for the proper frequency.

Be careful when you use a frequency counter to set the oscillator frequency. Neither circuit produces a perfect sine wave, so some counters may count each cycle twice or three times. Hence, the counter may read 2025 or 2225 Hz when the actual frequency is only half or one-third of that. If in doubt, you may use a piano or organ and listen for the appropriate tone—2025 Hz is just a bit under the third C above middle C, while 2225 Hz is the C-sharp just above it.

When communicating with an originate modem, you will have to send 2025 or 2225 Hz to the originate modem for perhaps two or three seconds before it will respond with 1270 Hz and start receiving data. At that time, the CARRIER light on the originate modem will light, indicating that it has received a signal from you. To make sure the modem is receiving your signal, listen to the 1270 Hz signal coming back to you: If you don't hear it, that means the modem does not hear you.

For experimental purposes, you can even tape-record your data on a cassette. Use a fairly good cassette recorder and be sure to use the same machine both for recording and playing back. Another way to keep the speed more constant is to use an ac adapter rather than rely on batteries.

So, to all you budding businessmen out there, here is a challenge if you want to make some money and offer a worthwhile service to other hobbyists. This might be your first step toward a successful hobbyist service bureau. ■

Reader Service—see page 147

Kilobaud Classified

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TRS-80 software on cassette or disk: mail, inventory, word processor, data base, stock, check, statistic, sort. Poi Pow, 96 Dothan St., Arlington MA 02174.

PET Super Card Game, great graphics. *31/Klinker*, dynamic computer logic. Lots of fun to play. Send $10 to Carol Donovan, 84 Christy Rd., Battle Creek MI 49015. Cassette included.

PET 1-Player Checkers. Graphic display, board shows all moves, realtime status shown. Send $5 to Carol Donovan, 84 Christy Rd., Battle Creek MI 49015. Cassette included.

TRS-80, Level I, 4K, software. Checkbook, Graphing, Demo. Pgm., Metric Teacher. All on tape for $10. Robert Lancelot, 1871 Acorn Dr., St. Joseph MI 49085.

Original PET Software! A variety of action games with graphics and sound effects, useful math routines, interfaces (Teletype, parallel printers and telephone) and a program for creating, saving and playing back music. Send for a free catalog today. Peter Ruetz, 368 Albion Ave., Woodside CA 94062.

TRS-80 Level II programs on cassette. 4K: Lunar/Martian Lander with 3 degrees of freedom ($8). 16K: Battle Klingons, Romulans with Star Trek ($10); you name teams in College/Pro Football ($12); shoot down attacking aircraft in Carrier Battle ($6). R. Fitzgerald, 3338 Sheila Lane #292, Dallas TX 75220.

Micropolis software special: Investment analysis package, $30; Home/family package, $30; Game package, $15; Assembly language prog. course for beginners, $30; Raw accts.-receivable program ready to personalize, $95. Order now. Phil Bell, 813 MacArthur Dr., Urbana IL 61801.

TRS-80 Monthly Newsletter. For information write to: Howard Y. Gosman, Box 149, New City NY 10956.

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*Books of computer games in BASIC. ENIGMAS-1 ($8): Gone Fishing, Concentration, Starship, Craps, Slot-Machine, Sherlock Holmes, Tank Attack. ENIGMAS-2 ($8): Number Guess, Mortar Battle, In-Between, Shell Game, Safari, Starship-2, Dice Roll, Puzzle. *Catalog and test program Frog Race, $1. Available in Standard BASIC, SWTP 8K BASIC or Radio Shack TRS-80 BASIC. Please specify. B. Erickson, PO Box 11099, Chicago IL 60611.

We had replacement panels made for our Altair 8800s. They're blue against a white background and really look nice! We'll sell the extras for $19 each. D.L. Tibbetts, 520 Schoolhouse Ln., Willow Grove PA 19090.

6800 microprocessors. Limited number. All new parts. $12 each. Mike Connolly, 7911 Langdon, Houston TX 77036.

Radar 1200-baud RAM Dump and Restore routine for SWTBUG (& others with minor mods) & AC30—no hardware mods. Loads 8K in 94 secs., 9X faster than SWTBUG. Extremely reliable, with error correction capability. 512 bytes. Object tape, relocator, instructions, $20. G. Trollope, 466 Caswallen Dr., W. Chester PA 19380.

TRS-80 Software: Business programs written in 16K Level II. Available for cassette or disk files. Send for list & prices. L. Owens, Rt. 6, Box 336A, Thomasville GA 31792.

Quality listings of your TRS-80 programs. Level I or II cassettes. Tractor-feed, notebook-size paper. $2 up to 4K, $4—16K, $6—32K, $8—48K. R. Urbassik, 13519 Carter, Painesville OH 44077.

TRS-80 Level II, 4K Text Editor. Versatile editing options make text composition a breeze. Blinking cursor, full graphics, fast machine language, tape I/O, screen print and more. $9.95. Don Coon, 1228 Alpine, DeWitt MI 48820.

TRS-80 Level II 4K complete system, new in box; $698, no tax, delivered COD. A. Mui, PO Box 2014, Oakland CA 94604. (415) 835-5411 5-10 PM. No collect calls please.

PET Users. Cassette & inst. for exciting game of Star Wars; $4.95. B.F. Klinchuch, 2744 Ashwood St., Orange CA 92665.

Educational software and other useful programs on cassette for TRS-80, Level II. Descriptions from Dr. S. Harter, Box 17222, Tampa FL 33682.

Sophisticated 2-player football game on cassette for TRS-80 Level II. Uses graphics to draw field, move ball, etc. Dr. S. Harter, Box 17222, Tampa FL 33682.

TRS-80 Owners! Tired of endlessly thumbing through your Level II manual? Send $1 and SASE and receive a complete (and I *do* mean complete) TRS-80 Level II Manual Index. You won't believe how much time this will save you. *Everything* is listed alphabetically. Send $1 to Dave Rose, 196 Governors Drive, Forest Park GA 30050.

Heath H-8 system. 16K RAM; 2 cassettes; parallel I/O; H-9 video display, all systems tapes and many program tapes. Fully assembled & working, $900. Also, Intertec Data INTERTUBE video terminal RS-232, 24×80 upper/lowercase & graphics. New, $650. I will trade all for a good RS-232 IBM wide-platen Selectric IO writer. Steve Vicker, PO Box 1548, Panama City FL 32401. (904) 769-4492 M-Sat.

DEC LSI 11 CPU board. Quantity of 2 4K core memory boards, qty of 1 2K PROM board, qty of 1 DLV 11 serial interface board. All diagnostic tapes and maintenance manuals included. PAL Assembler included. Asking $1200. Contact Al Schmidt, eves. phone (312) 554-3044. Rte. 3, Box 206, Oswego IL 60543.

PET-2001-8 Music kit: Install the amp and speaker in two hours. Drill only one hole above fuse. Software and all hardware inc. $14 & $1 postage. Lou Ensten, Box 6, Twinsburg OH 44087.

For Sale: Digital Group Phi-Deck cassette system. 4 computer-controlled tape drives in handsome cabinet, controller, cable, documentation and software. 2M bytes on line (C-60 cassettes) with any system. $675 or best offer. Write John Ciaccia, 5707 Valley Pt., San Antonio TX 78233 or call evenings (512) 654-0338.

OSI Software on tape 440 or 540:1)Fleet action, bio, math; 2)Starfighter, gleep, mastermind 540; 3)Demonstrator, bomber; 4)Gobbler, bouncearound; 6)Bowling, for graphics chip; 5)Kiddie video-pak; 7)Seawolfe; 8)Demo & bomber-graphics; 9)Concentration—$8.95 per pak with documentation; $60 for all. R. Olsen, 1690 Bolton, Walled Lake MI 48088.

ADM-3 Lowercase parts kits with complete instructions, $39. Nancy G., 57 Manor Drive, Hudson OH 44236.

TRS-80 Owners: Built limited number of modems for the TRS-80. Will work with any configuration of TRS-80. I will make them only to the amount of orders I receive in the first two months after this ad is published for the price of $50. After this, they will be $75. Delivery within two weeks after I receive the order. Send check or money order for a modem, two for 15% off, to Sandy Sigal, 6851 Mammoth Ave., Van Nuys CA 91405.

TRS-80 Users: Excellent business program for a 16K Disk BASIC TRS-80 computer with 1 or 2 disks. A mass indexing program that allows storing items and retrieving them for review, alphabetation, editing. At least 2000 items stored per disk. Alphabetizes automatically and is fully self documenting. Gives index of all items on disk. Excellent for all applications. $50 to Sandy Sigal, 6851 Mammoth Ave., Van Nuys CA 91405.

TRS-80 software on tape. Games and more with documentation. Also some hardware offerings. Send SASE for more info. Liberty Ridge Homestead, RR 1, Box 44B, Rockport IN 47635.

Micro Users Tax Booklet 78 shows how to slash taxes with deductions for micro. Many illustrations and examples. $4.99. MicroTax 78 completes 1040, schds A, B, C, D and others in minutes. Eliminates errors, missed deductions, and saves time. 16K TRS-80 Level II. $9.99. Save $2; order both for $12.98. Check or MO: George Clisham, PO Box 1172, Duxbury MA 02332.

TRS-80/POLY/PET software: Bomber, Biortm, Lander use graphics, fits 4K, on tape—$9.90. Request FREE catalog. (Specify computer type.) G. F., Jester Cntr-W58, Austin TX 78784.

Wanted. TRS-80 Level II software for Travel Agency accounting system. Art Lyon, PO Box 353, Ocala FL 32670.

Wanted: Manual for Instant Input Assembler-Version 1 (for 9900 Super Starter System by Technico). Will pay at least original cost. William T. Wilson, 203 Oxford St., Portland ME 04111.

For Sale: OSI Challenger 2p with 540 video and polled keyboard—with extra 4K board for a total of 8K. Price, $650. Bruce Higer, 19 Woodland Dr., Sands Point NY 11050. (516) 883-9543.

For Sale: RCA VIP assembled and tested with 4K static RAM and 8 bit I/O port. $245. S. Brohn, Jr., 10265 Darryl, Baton Rouge LA 70815.

Swiss business group is looking for buyer, representative, or contact man to buy hardware and software in the USA. Could also be part-time work, possibly someone retired. Write to: INTERFACE TECHNIC, PO Box 761, CH-4002 Basel, Switzerland.

Complete set Kilobaud magazine #1-21—$85. I pay postage. Nick Copping, 2744 Community, La Crescenta CA 91214.

TRS-80 Owners. I am interested in surveying TRS-80 users. Write: Professor Bill Parks, Chase-203, State University College, 1300 Elmwood Ave., Buffalo NY 14222.

TRS-80 Level II Reference sealed in plastic. Summarizes commands, reserved words, error codes and more; just $2 postpaid. Send SASE for list of well documented practical programs. J. DeMita, PO Box 570, Lynbrook NY 11563.

For Sale: 2 National Multiplex 3M3-A digital cassette recorders and 2S1OR interface/monitor board. Storage capacity per 3M data cartridge of up to 2 megabytes. Search capability up to 50 kilobaud/sec. Will sell for best price over $350. B. Wagman, PO Box 57091, Washington DC 20037.

For Sale: MECA dual cassette & controller, Digital Systems dual 8" & controller, 2 ea. 16K TDL memory boards. Make offer. (714) 770-7789.

Linear programming (Simplex Method): builds its own table: short easy data entry (free-form input on Level II): TRS-80 Level I & II: memory is dynamically allocated (10 equations—12 unknowns), will run in 4K: cassette & documentation; $15 ppd: Henry Camin, 7101 Chinaberry Rd., Dallas TX 75249.

KIM Users: Powerful Console Input Monitor (CIM) lets you enter, edit and execute programs from ASCII encoded kybd on basic KIM. CIM modes are: Address, Program, Text, Data, Increment, Decrement and Execute. CIM was developed by an experienced EE and is fully supported for future expansion. Complete user's manual includes interfacing ASCII kybd to KIM. $16.50 ppd. Add $5 for CIM cassette. E.R. Kittlaus, Box 2175, Seal Beach CA 90740.

For Sale: TI TM990/100M-1 microcomputer board with TIBUG monitor in ROM, 256 words of RAM, TM990/103 microterminal, TM990/511 extender board and all documentation. It is a great machine. I just don't have time to build a system around it. List price is over $750. It's yours for $550 ppd. Bill Ganoe, 1634 E. Drachman, Tucson AZ 85719.

33ASR like new, $850. 101C data set (110 baud modem), very nice, $200. Call Control Unit to interface above, $100. All three $1,000. Joe Turtle, PO Box 147, Corunna MI 48817. (517) 743-4607 after 6PM.

PET Programs: 50+ programs available. $2.50 first program & tape, $1.50 ea. add. program. SASE for list: R. Grokett, 401 Monument Rd. #177, Jacksonville FL 32211

TRS-80 Level II Software: CONTRACT BRIDGE, $15. Disassembler using Zilog mnemonics, $20. Assembler LIFE, $6. Send SASE for details. Hubert Howe, 14 Lexington Road, New City NY 10956.

CIRCLE CHESS instruction book by Alphonso, used in Circle Chess software development, $5. Stanonis, Box 63, Des Plaines IL 60017.

KIM-1 w/8K memory, 32×64 video board, cassette controller, power supply, oak enclosure, software. $600. James W. Stork, 2404 Broadway, San Diego CA 92102.

Microware Users Group: Reinventing RT68 or ABASIC wheels? First issue includes adaptions of compiler for printers, CRT terminals and SWTP calculator module. Send your great ideas and applications and/or $10 for year's subscription to MICROWARE FORUM, Box 3630, Dept. MK, Minneapolis MN 55403.

SWTP 6800 Users: My system has been running under hard use *continuously* for a year—all day, every day—with no failures. Send $5 for info package on reliability mods for SWTP. TARA, Box 3630, Dept. RK, Minneapolis MN 55403.

Disk Users: Would you like to store twice as much data on each disk? If your system uses the Shugart SA-400 drive, send $4.50 (the cost of a disk) to find out how. No hardware to buy. TARA, Box 3630, Dept. DK, Minneapolis MN 55403.

Educational games? SOLOMON HOUSE offers the Game of the States. PET graphics help make learning the names, spelling and geography of the states of the union fun for all ages. Information and list of available programs free. For Game of the States program tape and documentation send $4 to S. M. Solomon, 276 Buckingham Ave., Milford CT 06460.

Rockwell XPO-1 Development system for PPS-4/1 uPs. With optional assembler, p.s., 1K RAM. Never used. $450. G. Hyman, 22 Cross Hill Ave., Yonkers NY 10703. (914) 968-9700.

More people than ever are using the classifieds. Shouldn't you be?

KB CALENDAR

Blacksburg VA

A new and expanded series of four 3-day hands-on workshops on 8080/8085 design, microcomputer interfacing, software design and digital electronics is being given by the authors of the popular Bugbooks. Participants have the option of retaining equipment used in these courses. Dates are March 19 to 28, 1979. For more information, contact Dr. Linda Leffel, C.E.C., Virginia Polytechnic Institute and State University, Blacksburg VA 24061, (703) 961-5241.

Anaheim CA

MIMI '79 Anaheim International Exhibition will be held January 16-19 at the Disneyland Hotel, 1150 W. Cerritos Ave., Anaheim CA 92802. For further information, contact Armida Hisquierdo, MIMI '79 project manager, 1811 W. Katella, Suite 105, Anaheim 92804, (714) 774-6144.

CORRECTIONS

In the October 1978 New Products section, page 16, we mistakenly listed the address of R2E of America as 306 University Ave., Minneapolis MN 55414. That address should have been 3406 University Ave., Minneapolis 55414.

Regarding my article, "Home System Demo Program," in the September 1978 issue of *Kilobaud*. I have recently changed my address, causing problems for people trying to get in touch with me. My new address is: 948 Valentine Road, Oconomowoc WI 53066.—Mark Herro.

Notice of Copyright

Regarding the use of "Context" in "(Con)text Editor" by R. M. Law and D. C. Mitchell (September 1978, p. 22): our Corporation are registered owners of the word "Context" as it relates to programs and equipment, etc.

Context Systems, Inc.
London, Canada N6A 3C7

✓ Reader Service—see page 147

Little Bits

Glen Deibert
431 Dunmore Rd.
Fayetteville NC 28303

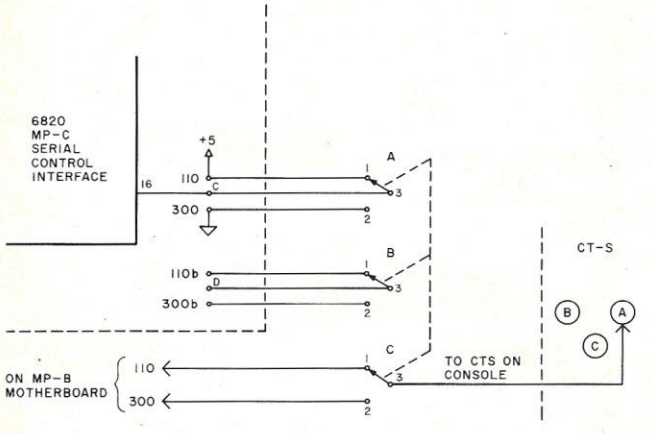
Baud Rate Control for the SWTP

I recently had the experience of connecting a 100 wpm printer to my SWTP system and very quickly became tired of writing my BASIC programs, debugging and listing at a 110 baud rate. This slow working system was modified as shown in the schematic shown below. By changing the switch position I could do all my work at a faster speed, including using my tape interface.

After the program had run correctly on my video display and everything looked good, I changed the switch position to the 110 baud rate, accessed my printer and let it go at its slow speed. Note that the clock for my CT-1024 also comes from the MP-B motherboard.

To prevent unwanted radiation and its inherent problems, the wiring to the switch should be twisted and run close to the chassis. On my system I installed the switch on the upper left-hand corner of the face plate and tacked soldered wires to the 110 and 300 baud connectors on the MP-B board and then to switch C. The wiring to the MP-C board was run down against the bottom of the case and back to the MP-C board.

I can now do my thing at 300 baud and let the printer do its thing at 110 baud, and we are both happy.



Baud rate control for SWTP system.

Albert C. Brunelli
RFD #1
Berlin NH 03570

One Incompatibility, Solved

I am responding to Bill Fuller's request for information ("Compatibility and the Altair Bus," p. 100, *Kilobaud*, July 1978) regarding compatibility of various products.

I recently purchased the Cromemco D + 7A (seven-channel A/D and D/A with one parallel I/O port) for use on my system, which consists of PolyMorphic CPU and video boards with 16K RAM in a TEI 12-slot mainframe.

The assembly of the board was relatively easy, but I would not recommend it for a novice. The instructions were quite clear on how to rejumper the port address lines as is necessary when using the PolyMorphic CPU. The fun began when it came time to calibrate the converter.

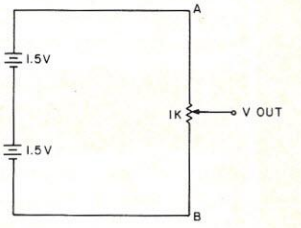


Fig. 1.

I used two D cells and a 1k pot as shown in Fig. 1, along with a Fluke 8020 DMM to set the calibration voltages. The ground lead will go to either A or B, as both positive and negative voltages are required for calibration.

With everything hooked up and ready, I turned on the machine and entered the calibration program. Nothing happened! I received no output from the converter at all. I rechecked all the connections and supply voltage levels and found everything in order there.

Next I took out the scope and started checking the address and data lines to make sure everything was coming in all right. They were OK, so I next checked the signals into the decoder on the board. Naturally, the decoding section is down near the bus where it is difficult to get at with a probe (some day I will have to get an extender board). If access to the decoder had been easier, I would have found the problem sooner. As it was, I had to find it on the schematic.

One of the signals into the 74LS30 decoder was an inverted PHLDA. The PolyMorphic CPU does not output such a signal, and thus one of the input lines to the 74LS30 was always held low by the inverter, and my address was never decoded.

To solve this incompatibility, I placed a jumper across C59, which is a 150 pF capacitor at the input of the PHLDA inverter (Fig.

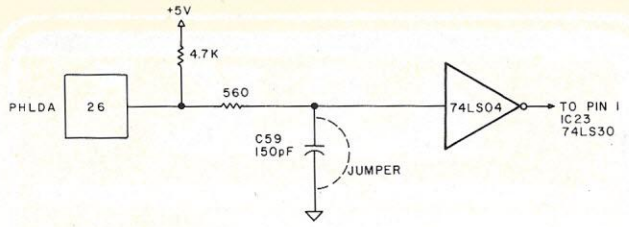


Fig. 2.

2). This jumper will hold pin 1 of the 74LS30 high at all times and will enable me to address the port. Also, it is easily removed in case the board is to be used in a different system.

I think that problems like this could be avoided if the manufacturers would include more information on the operation of the hardware.

James J. Brennan
3475 Auburn-Folsom Rd.
Loomis CA 95650

VDM Clock Program: for Those Idle Moments

The following is an excerpt from a letter that accompanied this Digital Clock Program.

I have neither the time, skills nor inclination to write detailed articles, particularly on software. On the other hand, I am more than willing to share what I have with others if I can do it with "zero hassle," or something approaching it.

I can't help but believe that there are many others who feel the same way and would take the time to print a listing and a run of their programs, and perhaps enclose a short informal note about them, and spring for the postage. I, at least, am not usually interested in doing much more than that.

I enjoy fully documented articles along with the software you publish because they are helping me learn; but I am also interested in *using* this machine, even if I don't fully understand just what is going on inside it. Without software, this thing just sits here, so I like to see even undocumented software published (so long as it runs).

I really believe that if you offered to publish your readers' efforts, without trying to turn them into authors, you would see a lot of freely given programs of interest to your readers (or at least some of your readers) coming across your desk.

My system is an Imsai with 28K, a Tarbell interface, VDM and a Qume printer in an ITS (now a DMC) terminal. The real purpose behind this system is to eventually figure out how to run my pipe organ (four manuals, 140 ranks of pipes, e.g., about 7000 pipes) and record what was played. That's another story!

I hope you'll give thought to my suggestion for a readers' software section. If you set up something like that, I'll send you some more listings, including some that I submitted to one of your competitors if they don't get around to printing them (and I doubt that they will, but that's also another story!).

We're definitely not looking for War and Peace*-length programs with no accompanying article/documentation. But if you want to do something similar to what Jim suggests in the second paragraph, send your efforts in and we'll give them due consideration.*

```
100 REM   DIGITAL TIME CLOCK PROGRAM
200 REM   WRITTEN BY JAMES J. BRENNAN
300 REM   SEPTEMBER 3, 1976
400 REM   USING ALTAIR BASIC, 12 K VERSION 3.2
450 REM
500 PRINTCHR$(126)
600 DEF FNV(X) = X-13313
650 PRINT"THIS PROGRAM WILL DISPLAY A DIGITAL TIME CLOCK IN THE
660 PRINT"FORMAT:
670 PRINT
680 PRINT TAB(20):PRINT"HH MM SS ZZZ"
685 PRINT
686 PRINT"WHERE H=HOURS, M=MINUTES, S=SECONDS, AND Z=TIME ZONE
690 PRINT
700 PRINT"ENTER THE TIME IN TWO DIGIT NUMBERS SEPARATED BY SPACES
800 PRINT"BETWEEN THE HOURS, MINUTES, AND SECONDS.
850 PRINT
900 PRINT"WHAT WILL BE THE EXACT TIME THAT YOU WILL HIT THE
910 PRINT"RETURN KEY";
1000 INPUT T$
1100 TH=VAL(MID$(T$,1,1)) +48
1200 H=VAL(MID$(T$,2,1)) +48
1300 TM=VAL(MID$(T$,4,1)) +48
1400 M=VAL(MID$(T$,5,1)) +48
1500 TS=VAL(MID$(T$,7,1)) +48
1600 S=VAL(MID$(T$,8,1)) +48
1800 PRINTCHR$(126)
1900 OUT 200,0
2000 IF ST=58 THEN ST=48:S=S+1
2100 IF S=58 THEN S=48:TS=TS+1
2200 IF TS=54 THEN TS=48:M=M+1
2300 IF M=58 THEN M=48:TM=TM+1
2400 IF TM=54 THEN TM=48: H=H+1
2500 IF H=58 THEN H=48:TH=TH+1
2600 IF TH=49 AND H=>51 THEN TH=48:H=(H-2)
2700 IF TH=50 AND H=48 THEN TH=48:H=56
2800 IF TH=50 AND H=49 THEN TH=48: H=57
2850 IF TH=50 AND H=50 THEN TH=49:H=48
2860 IF TH=50 AND H=51 THEN TH=49:H=49
2870 IF TH=50 AND H=52 THEN TH=48:H=48
2900 IF TH>50 THEN GOTO 9000
2901 IF H>57 THEN GOTO 9000
2902 IF TM>54 THEN GOTO 9000
2903 IF M>57 THEN GOTO 9000
2904 IF TS>54 THEN GOTO9000
2905 IF S>57 THEN GOTO 9000
2906 IFTH=>50 AND H>3 THEN GOTO 9000
3000 POKE FNV(475),TH
3100 POKE FNV(476),H
3200 POKE FNV(477),32
3300 POKE FNV(478),TM
3400 POKE FNV(479),M
3500 POKE FNV(480),32
3600 POKE FNV(481),TS
3700 POKE FNV(482),S
4000 POKE FNV(485),80
4100 POKE FNV(486),68
4200 POKE FNV(487),84
5000 S=S+1
6000 Q=273
6100 FOR I=1TO Q
6200 NEXT I
7000 GOTO 1900
8000 REM TO MAKE THE CLOCK RUN FASTER, REDUCE THE
8001 REM VALUE OF Q IN LINE 6000.
8002 REM
8003 REM TO CHANGE THE LOCATION OF THE DISPLAY,
8004 REM CHANGE THE VALUES OF FNV(   ).
8005 REM IN LINES 4000 - 4200 THE LAST TWO DIGITS ARE
8006 REM THE CODES FOR P D T , TO CHANGE TO SOME OTHER
8007 REM TIME ZOONE, ENTER THE ASCII CODE NUMBERS OF THE
8008 REM CHARACTERS DESIRED.
9000 PRINT" THIS IS NOT A POSSIBLE TIME IN THIS WORLD.  WHERE
9001 PRINT" DID YOU COME FROM?  START OVER BY TYPING RUN AND HIT
  RETURN.
9003 END
OK
```

Program Listing.

Short Program to Print SWTP Instruction Code

Richard Wright
676 Coe
Tiffin OH 44883

A friend sent me a copy of SWTP BASIC on cassette but no documentation. I wrote the following program to print the instruction code.

This program (SWTP 6800) prints ASCII characters between memory locations pointed to by A061, A062 and A06A, A06B and returns the MIKBUG at the end of the run. It starts at A060.

As listed, A061, 62 and A06A, 6B point to SWTP 8K BASIC version 2.0 instruction code.

```
A060   CE   0160   LDX #0160
A063   A6   00     LDA, 0,X
A065   BD   E1D1   JMP OUTEEE
A068   08          INX
A069   8C   0350   CPX #0350
A06C   26   F5     BNE
A06E   BD   E0E3   JMP MIKBUG
```

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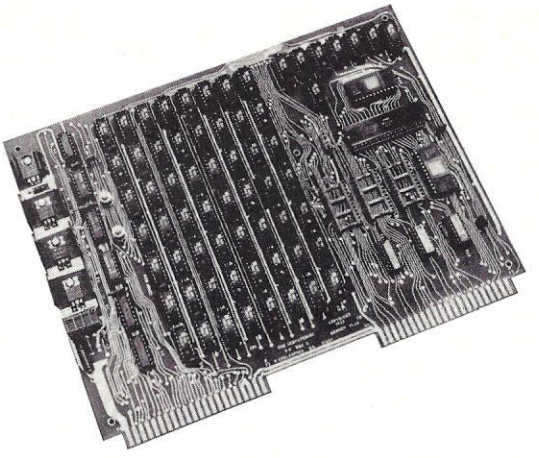

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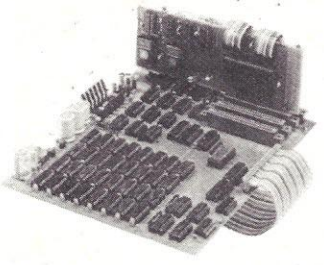

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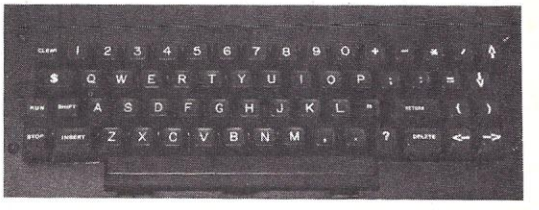

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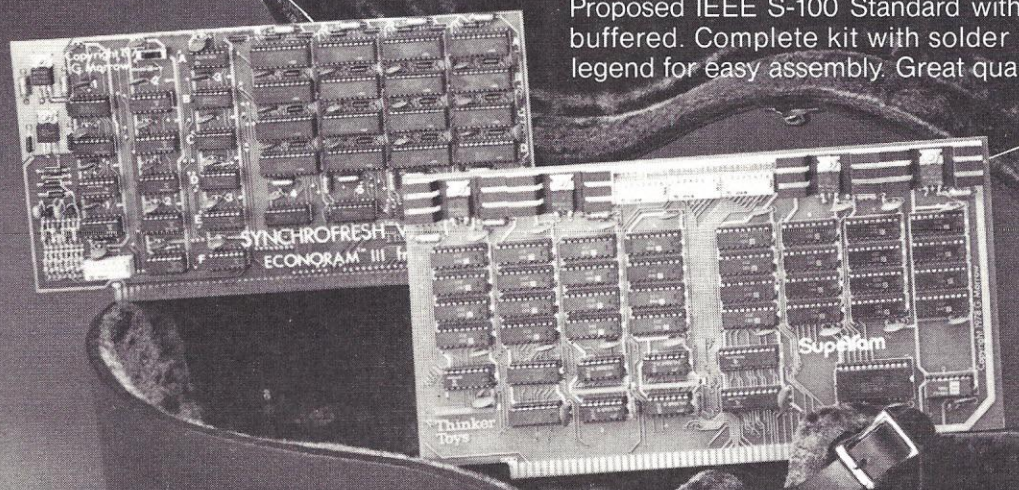

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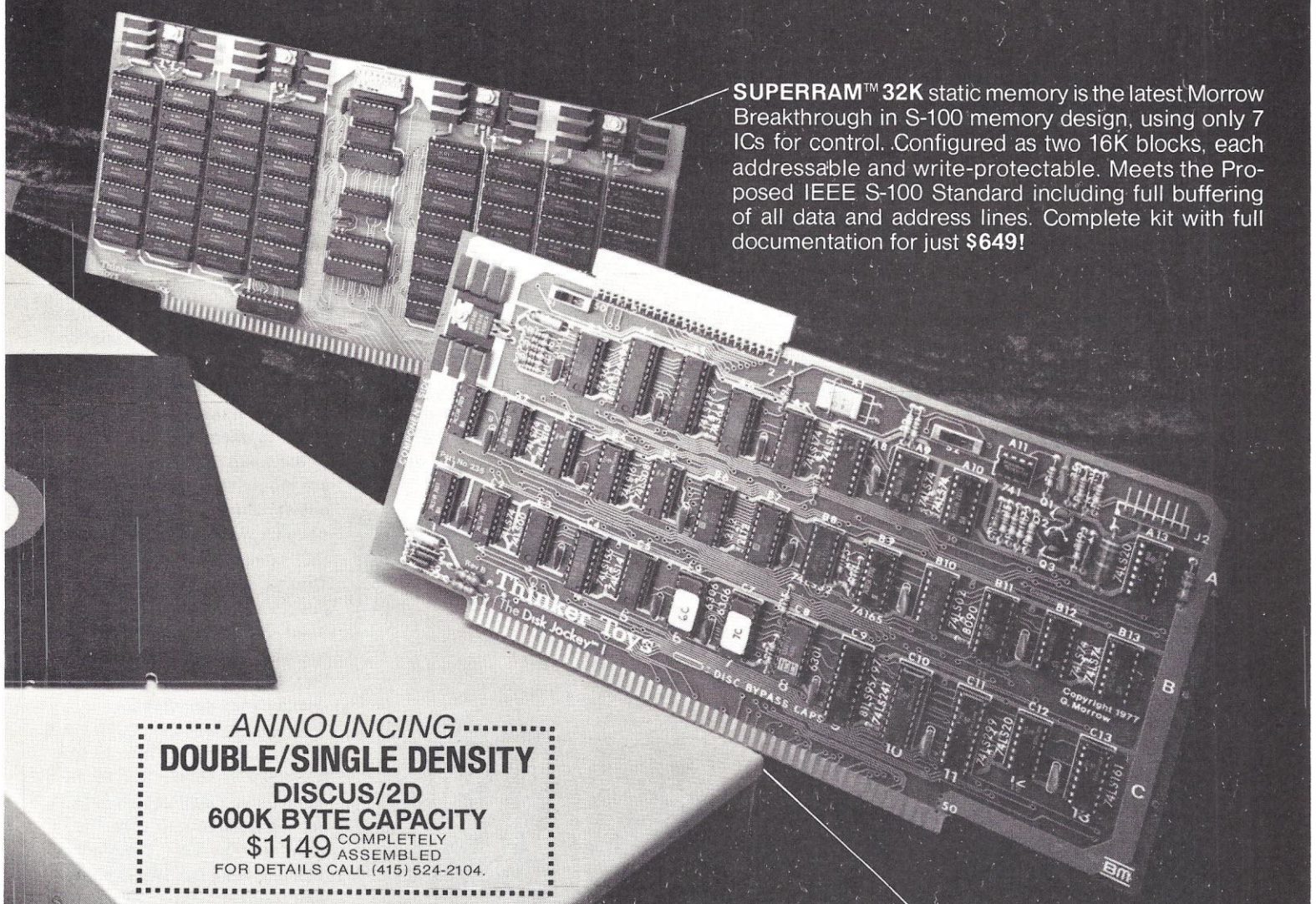

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Keeping Ma Bell Happy

Pleasing mother monopoly isn't always easy, but here are some dos and don'ts that will help to keep her from slapping your interface.

Shortly after I started personal computing, it occurred to me that my computer had the potential to be a powerful tool in my work. However, I didn't want to carry the whole system back and forth from my office. My wife had written a program to estimate the cost of printing books and, when necessary, wanted to be able to access the program from her office. The solution to our dilemma was apparent—use the telephone system to communicate with the computer via a portable terminal and modem.

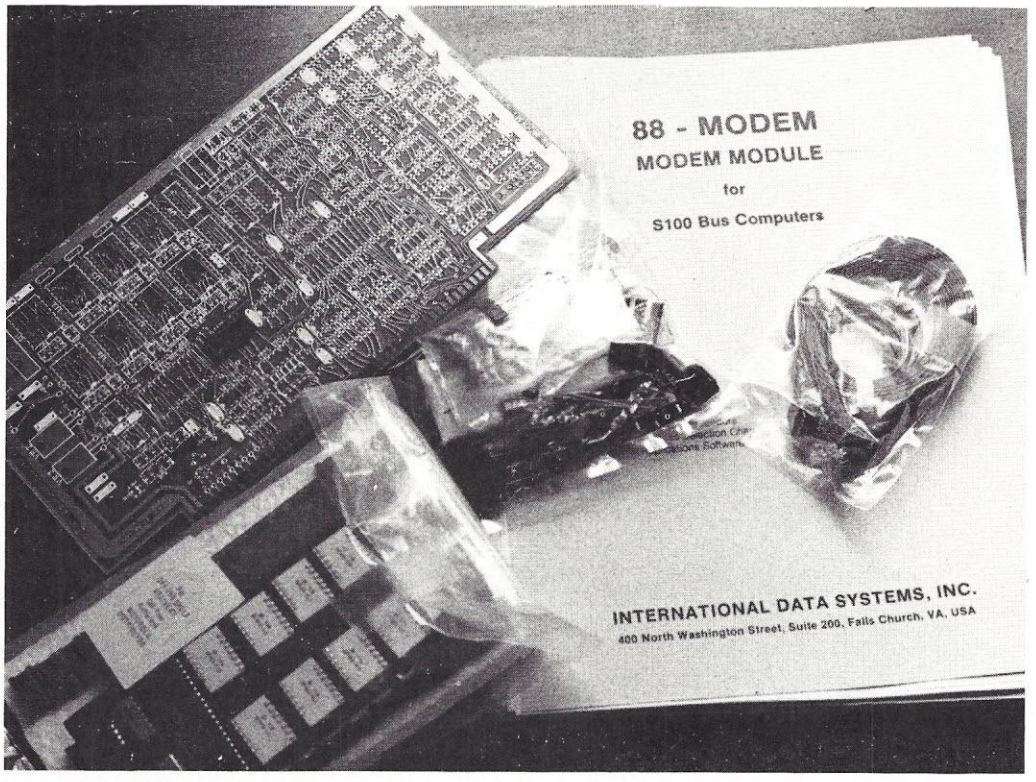
In fact, as I began to think about adding a modem, all sorts of applications came to mind. From work, I could direct the computer to turn something on or off at home or periodically monitor the status of the house. I could offer to share some time on my computer with a friend. Maybe I would have the computer periodically call up one of those stock-price services, sample the price of some selected stocks and run the data through a stock-market analysis program. I could even have some space war games in which my computer and I could play against someone else and his computer with the phone supplying the data link.

Well, it took a year for my dreams to reach fruition. It took that long because I started with no knowledge about what I needed to get a modem up and running on my Altair 8800. I now have the knowledge, and I am about to share it with you.

There are modems and there are modems. I wanted mine to answer an incoming call and connect the calling terminal to the computer "unattended." That is, the modem and computer would answer the call by itself. This type of modem, connected directly to the phone line, is called an *automatic answer/originate modem.*

There are two types of automatic modems available to the hobbyist for connection to the voice-band telephone network: the stand-alone RS-232 type, such as the Bell Dataphone 103, and the S-100-bus-compatible modem board. The Dataphone 103 rents for about $35 to $40 per month from the phone company.

It is relatively easy to interface (at least for operation in an automatic answer mode). All you need to do is connect an RS-232 input/output port on your computer to a corresponding port on the modem. Once the modem is connected to the computer, calling into the



The 88-Modem board before assembly.

modem via a portable terminal causes everything to behave as if the terminal were connected directly to the computer via an RS-232 connection.

The S-100-bus-compatible modem boards, on the other hand, require more software linking with the computer. They behave like a serial input/output board and are controlled and addressed in a similar manner. As a result, the S-100 boards can be made to do more under computer control, such as automatically dialing a phone number.

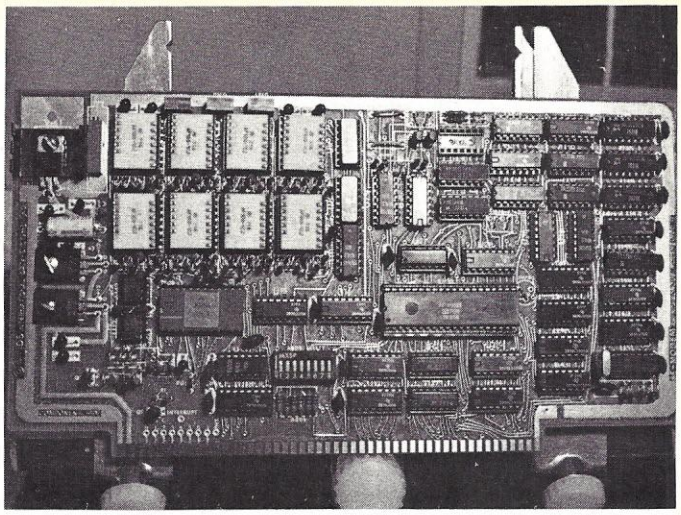
For my purposes, I decided to buy an S-100-bus-compatible modem board; specifically, the International Data Systems 88-Modem kit ($245). The 88-Modem kit is not intended for beginners. Although the instruction manual is clearly written and detailed (over 100 pages), the board uses very high density mounting of components. For example, the resistors are mounted vertically to conserve space. The kit is of very high quality; however, it arrived without two capacitors and an errata sheet. International Data Systems had the missing parts in my hands a few days later and, in five evenings, I had the kit assembled.

Even though the kit was assembled, I could not connect the modem to the phone lines. The instruction manual explained that the board could only be connected to the telephone system via a *CBT data access arrangement*. Without the CBT I couldn't even test whether the modem was operating properly. Why couldn't I just connect the modem directly to the phone line?

Besides the fact that the modem requires some of the circuitry in the CBT to operate as intended, it's against federal law!

I learned that the FCC regulates the phone system much as they regulate radio and television transmission. Part 68 of the FCC's regulations lists detailed technical requirements for the connection and operation of data communication equipment using the telephone system. These regulations not only apply to equipment that is directly wired to the phone system, but also to equipment that is *acoustically or inductively* coupled to the phone system.

They specify frequency bands, certain timing requirements and power levels within which the communication equipment must operate. Failure to abide by these technical requirements can cause signal interference in your neighbor's phone; damage to your computer, modem or the telephone system; billing errors; transmission interruptions; and activation of certain telephone company circuitry, resulting in poor data transmission. The FCC regulations allow the phone company to discontinue service to subscribers who fail to obey the rules. In fact, state laws provide for criminal penalties for certain violations.



The final product.

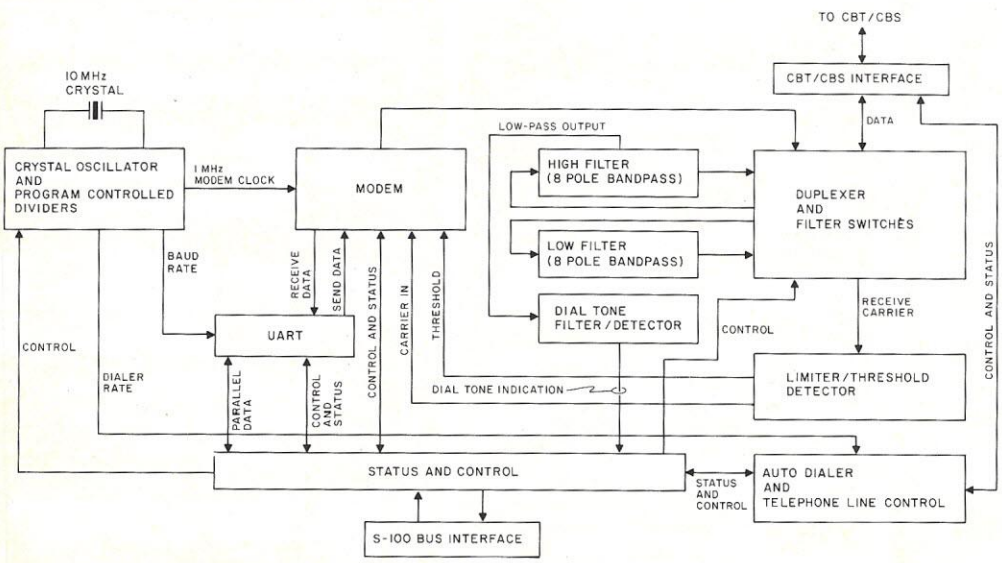
In short, I decided to hook up my modem legally via the CBT specified by the International Data Systems instruction manual. The manual listed two ways of obtaining the proper CBT: I could purchase the device from IDS with the necessary phone jack for $125, or I could rent one from the phone company. I decided to find out what the phone company's rental price was, so I called their residential service office.

After spending 20 minutes explaining to a representative that I owned a computer and modem and wanted to know the monthly rental rate for a CBT (the representative initially responded, "What's a CBT?"), I was told I would have to call a data-service representative for that information.

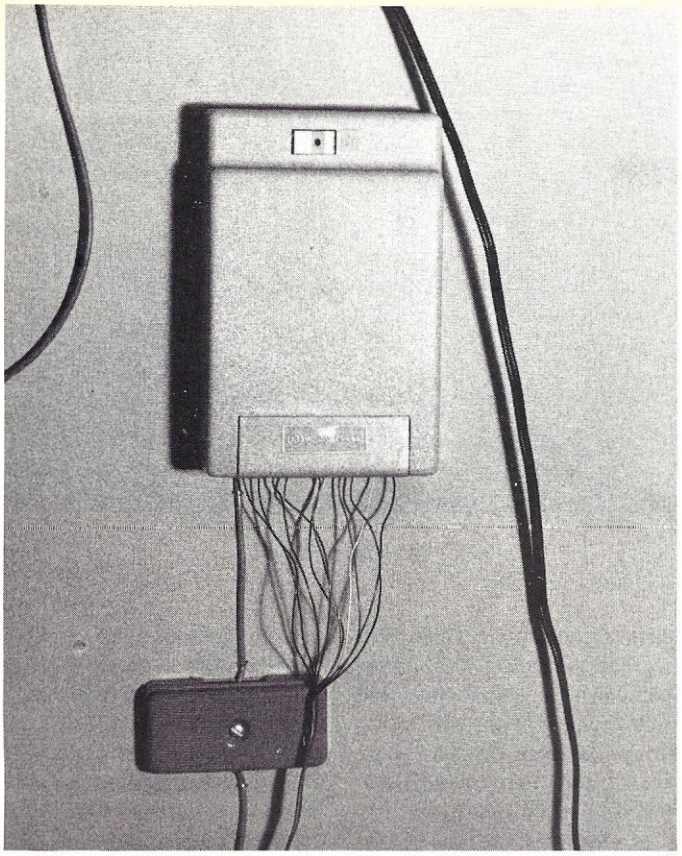
The data-service representative was helpful and explained that the CBT rented for $4 a month. However, he told me that all the phones on the line would have to be changed to special phones designed to be operated with a CBT. (These special phones have a switch that disables the CBT when the phones are being used.) He also explained that these phones could not be connected via phone jacks.

As an alternative, he suggested that I might consider adding an additional telephone line. The lowest priced phone line available was an "incoming calls only" supplemental residential line for $7 a month. Although I also planned to call out on my modem in the future, I decided that the savings might be worth only being able to call into the computer. The total cost of a Bell CBT would be $11 a month plus a one-time $25 installation fee.

The phone company representative said that the CBT couldn't be installed for a month! A month later the installers arrived (also mumbling, "What's a CBT?"), and by the



Block diagram of the system.



The Bell System CBT—necessary to connect the 88-Modem to the phone system.

end of the day they had the CBT installed. However, I still couldn't use the modem because it still had to be patched into my Altair's BASIC interpreter.

You see, the 88-Modem can be operated in several modes under software control. The modem occupies four consecutive input/output addresses. These addresses are used to control the number of bits and stop bits, parity, the proper transmission frequencies for originate or answer mode operation, length of time after loss of signal before the modem disconnects from the line, baud rate, and some other user-selected functions, as well as providing for data input and output.

Other addresses provide status signals which indicate that data either can be transmitted or has been received, whether the on-board automatic dialer is in the process of dialing, whether the remote terminal has transmitted a command to break transmission, whether a remote modem is connected to the other end of the line, and whether a dial tone has been detected.

The IDS instruction manual provided the necessary machine-language data handler and patches for Altair 3.2 and 4.0 8K BASIC. The data handler, when patched to BASIC, sets up the on-board UART for the specified bit number and rate and changes the frequencies to the proper values for operation in the answer mode. The handler then checks to see if the phone is ringing via the status addresses. If the phone is ringing, the modem answers, puts a tone on the line to disable the phone company's echo suppressors and listens for a remote modem at the other end of the line.

I entered the patch provided for 4.0 8K BASIC, called into the modem from my other phone line (another good reason for having a second line installed) with a portable terminal, and nothing happened! The modem had answered the phone, but when I typed on the terminal, the modem hung up.

After several hours of troubleshooting I found the problem. My portable terminal was set for a transmission rate of 110 baud with two stop bits, while the IDS data handler was setting the modem to 300 baud with one stop bit. I modified the software and tried again. This time it worked! After a year of planning, I finally had a working auto answer/originate modem.

As a footnote: In preparing this article, I learned an interesting fact—not all modems sold to hobbyists conform to FCC regulations. (The IDS 88-Modem, when connected to a properly installed CBT data-access arrangement, does conform to all regulations.) Also, if you decide to buy a CBT for interconnection and install it yourself, you must inform the phone company to what line it is connected, the FCC registration number of the CBT, the ringer equivalence number and what type of modular jack is being used to connect the CBT to the phone line. The only way you can legally connect any equipment yourself is by plugging the equipment into a phone-company-installed jack.■

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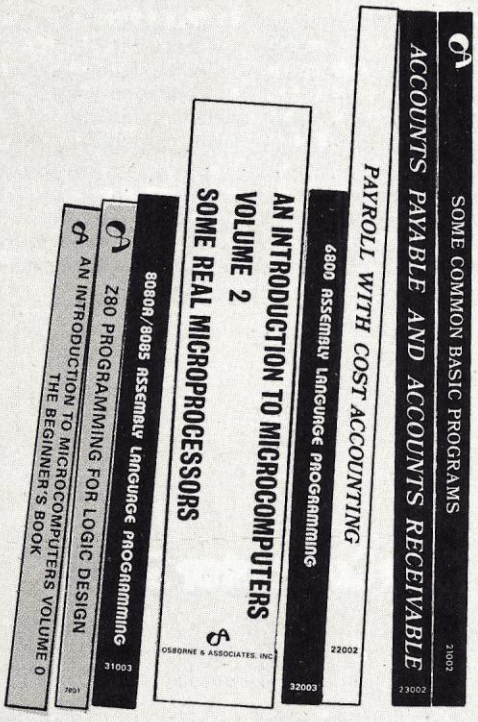

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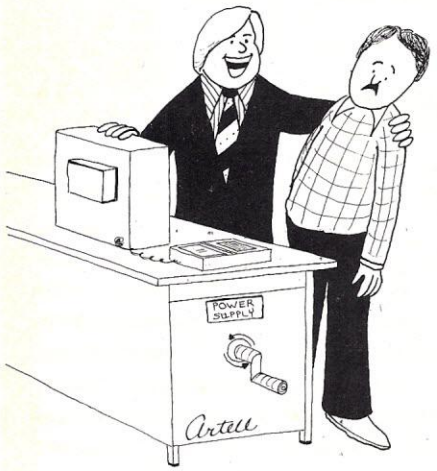

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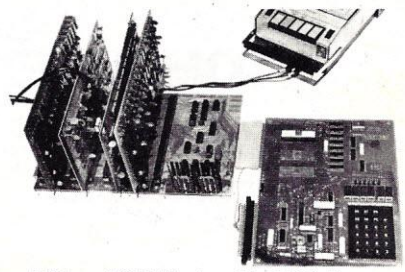

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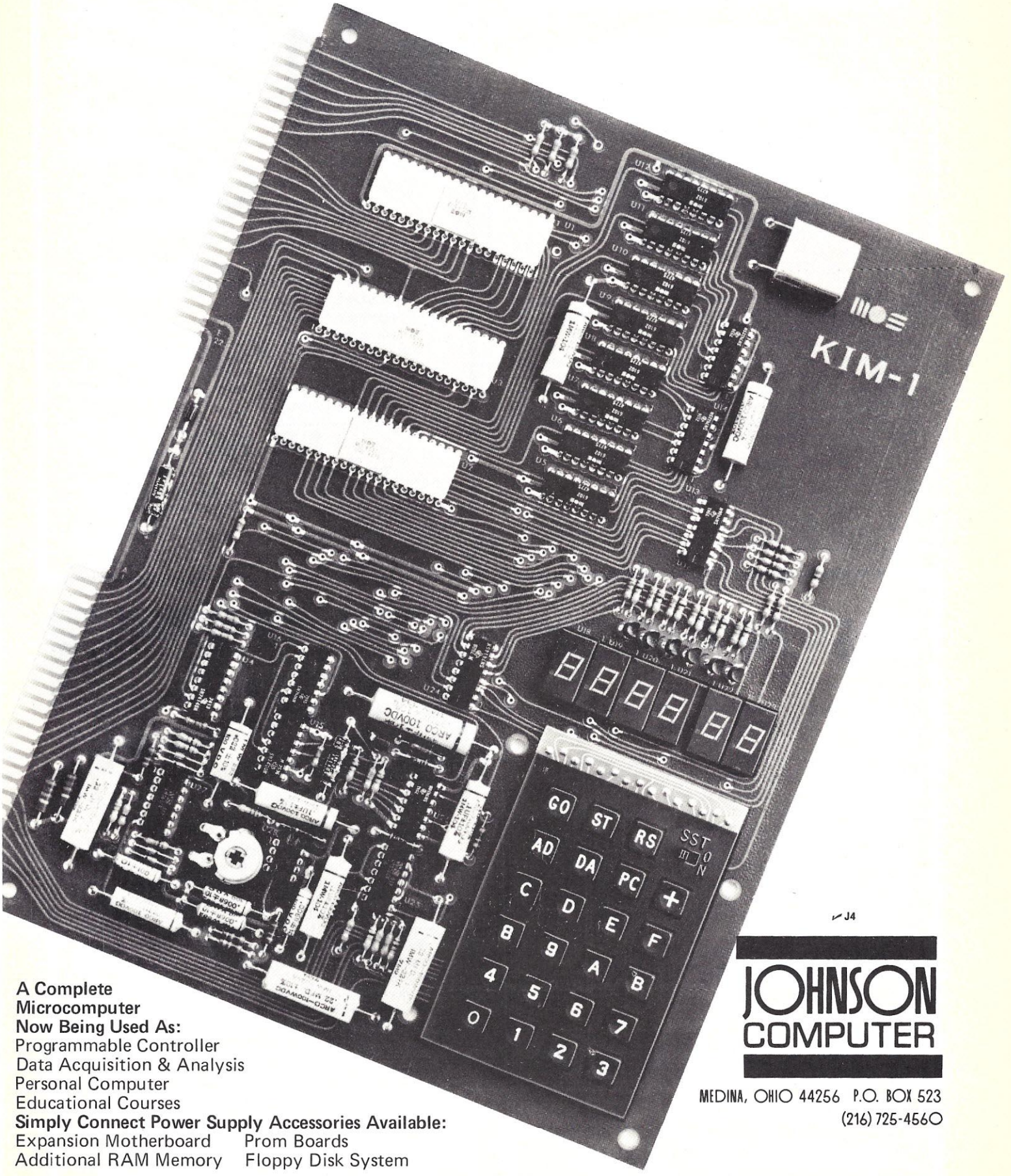

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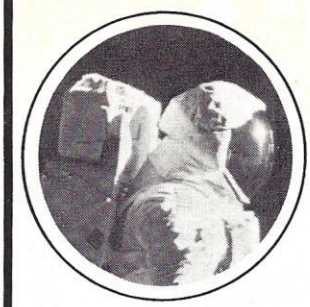

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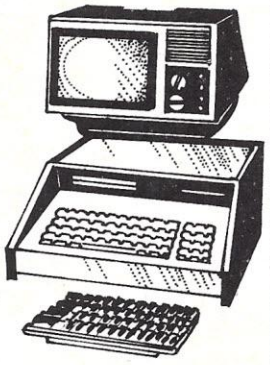

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Example: **THE SOURCE** produces the disk source file below from the following object code:

```
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1F 1F 1F 1F CD 1F 01 F1 CD 1F 01 3E 20 18 04 E6
0F C6 30 C5 E5 5F 0E 02 CD 05 00 E1 C1 C9
```

```
        ORG     0100H
LBL000  EQU     0000H
LBL001  EQU     0002H
LBL002  EQU     0005H
LBL003  EQU     000AH
LBL004  EQU     000FH
LBL005  EQU     0020H
LBL006  EQU     0030H
LBL007  EQU     0080H
        LXI     H,LBL007
        MVI     B,LBL003
LBL008: MOV     A,M
        CALL    LBL009
        INX     H
        DJNZ    LBL008
        JMP     LBL000
LBL009: PUSH    PSW
        RAR
        RAR
        RAR
        RAR
        CALL    LBL010
        POP     PSW
        CALL    LBL010
        MVI     A,LBL005
        JMPR    LBL011
LBL010: ANI     LBL004
        ADI     LBL006
LBL011: PUSH    B
        PUSH    H
        MOV     E,A
        MVI     C,LBL001
        CALL    LBL002
        POP     H
        POP     B
        RET
LBL012:
        END
```

THE SOURCE runs on either an 8080, 8085 or Z-80 microcomputer under CP/M*. Object code is transformed into a source file on disk ready to be assembled or edited. Z-80 mnemonics produced are switch selectable for either TDL's Macro Assembler or MAC* (Zilog mnemonics: inquire). Many other switch selectable options to aid in disassembly.

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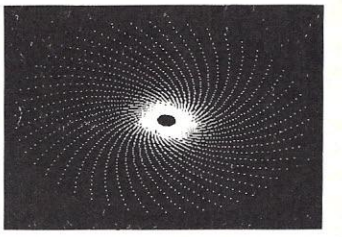

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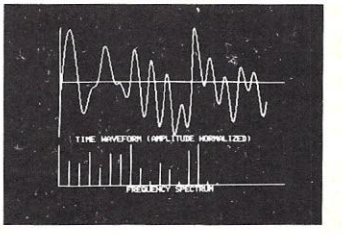

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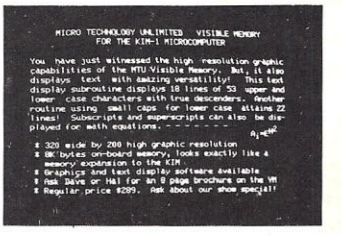

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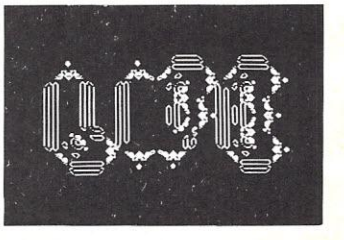

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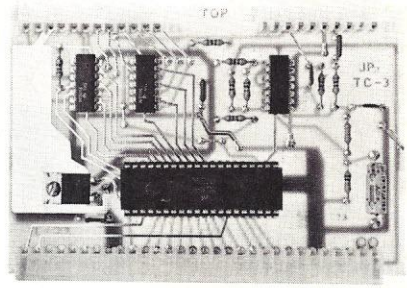

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NEW PRODUCTS

(from page 16)

multiple space compression and tape I/O are used for efficient file storage. U-draw ($17.95) is a high-resolution programmable graphics editor with tape I/O for storing finished drawings. It can be used for interior design and computer art. Documentation includes instructions for linking figures to user programs.

The Electric Crayon ($17.95) is a graphics editor similar to U-draw but in brilliant low-resolution color. The Music Box ($12.95) gives three-octave sound with no additional hardware. Type in the song and the Music Box will play it for you. Notation includes sharps, flats, note time, rests, dotted notes and tempo. It is easily retuned for special effects. The Number Cruncher ($9.95) is a set of single precision math and ASCII-to-hex subroutines.

MUSE software also includes games ($12.95 each): Tank War, Maze, Side Shows and Escape. Guaranteed loading on all tapes.

The MUSE Co., 7112 Darlington Drive, Baltimore MD 21234.

The CmC Word Processor for the PET.

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Cover Craft, PO Box 555, Amherst NH 03031.

PET Word Processor

Word processing has come to the microcomputer with this $29.50 program for the PET. It's from Connecticut microComputer (CmC) and is designed to work with their printer interface unit ADA 1200C, which sells for $169 complete. You supply the printer.

The word processor allows you to type and edit letters or other forms. It's not much more difficult to learn to use than most of the higher-priced spreads, but it will probably take you a day or two to get used to all of the special coding methods. You have to learn to use any word processor and become familiar with the commands and directives that make it work. In the case of the CmC processor you'll have to get

✓ Reader Service—see page 147

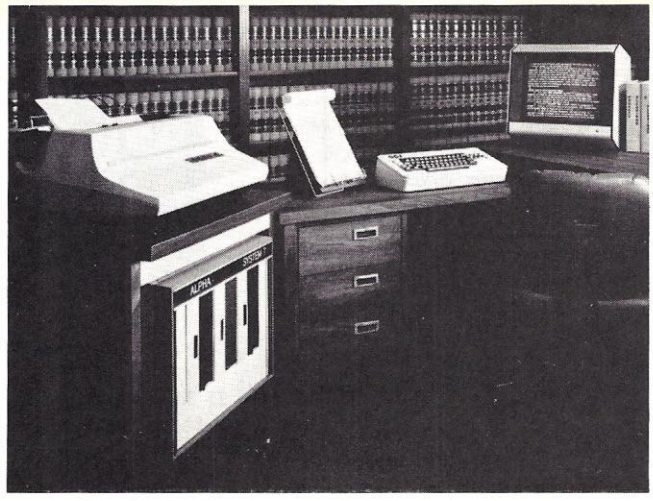
used to about 25 special codes that move the pointer around, allow editing, set line lengths, line spacing, indents, etc.

For your $29.50 you get the program on a cassette plus a 25-page instruction booklet. The instructions are reasonably clear so, with a bit of practice, you'll be typing letters with your PET in short order.

Of course, the drawback to all of this is the cost of the printer. If you want to end up with first-rate copy you are talking about an IBM Selectric typewriter . . . and that costs more than the PET and interface. You might rationalize the expense on the basis that nothing short of that is going to satisfy you, no matter what computer you get, so what the heck?

The less expensive matrix printers produce readable copy, but not attractive copy. The Diablo and Qume printers provide beautiful copy, but cost about double the Selectric. If you don't mind ending up with all capital letters, you can get a $50 Teletype printer and use that! You end up with typical crummy Teletype copy . . . but at least it's inexpensive.

Connecticut microComputer, 150 Pocono Road, Brookfield CT 06804.



Alpha System 7 law office computer.

For Lawyers Only

The Alpha System 7 is a word processor designed specifically for law office use, incorporating a full-fledged Z-80 microcomputer system with 56K of static RAM. The system allows automatic search and replacement of any variable such as client name, dates, locations and amounts. Once a document is entered, it need never be entered again as only the variables are changed. For example, a 25-page pleading can be changed, as to any name, date, sum or any other variable that occurs, in less than two seconds! Pages, paragraphs, lines, words or characters can be inserted, deleted or changed with the system automatically opening or closing text to accommodate the inserted, deleted or moved text. The results are instantly visible on the screen.

The legal time and cost system is designed to accommodate from one to 20 or more attorneys. All accounts receivable and trust account ledgers are stored, and statements may be viewed or printed at any time. Numerous management reports, including aged reports by matter, client, attorney and other variables, are available. Trust accounts are handled in a similar fashion.

The attorney calendar system can display and print calendars by client, attorney, secretary, case number, time or date. Entries may be made for deadlines years in the future.

The word processing system utilizes a high resolution 22 MHz 15 inch video display and a high-speed 45 cps daisy wheel letter quality printer. Margins, justification, pitch, centering, boldface type, line spacing, headings, underlining and automatic page numbering are under program control and may change dynamically during printout by inserting appropriate commands within the text.

Storage medium is dual 8-inch flexible IBM 3740 format disks with a capacity of well over 100 pages of text per disk. (Third disk drive is available at extra cost.)

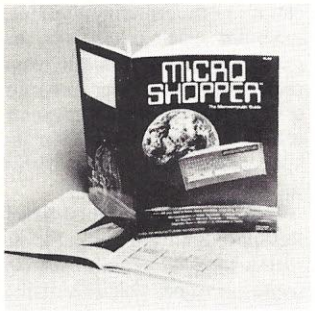
Additional programs, such as financial, investment and pay-

✓ Reader Service—see page 147

roll, are available. Furthermore, since this is a complete computer system, custom programs may be written for nearly any purpose. Available languages include BASIC Interpreter, BASIC Compiler, FORTRAN 80, COBOL and PASCAL.

A users group has formed and its newsletter provides a catalog of available pleadings, contracts, wills and trusts, correspondence and other documents on disk ready for immediate entry into memory. Only a nominal copying and mailing charge applies. Lease/purchase prices are as low as $300 per month.

Alpha Professional Systems, Inc., 9465 Wilshire Blvd., Suite 518, Beverly Hills CA.



MicroWorld's guide.

The MicroShopper

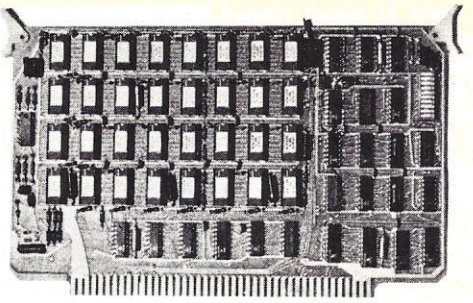
The new fall 1978 *MicroShopper*, the recognized leading buyer's guide in the field of microcomputers, is now available. The *MicroShopper* serves as an invaluable aid to match the applications software to hardware for a complete business system.

The world of microcomputers —from inexpensive home games to versatile multi-user systems— is presented in easy-to-understand terminology. Text is written clearly enough for beginners to understand but contains enough information to satisfy professionals in the microcomputing field.

The *MicroShopper* features an introductory text on microcomputing and a section on how to select a microcomputer system for business applications. Also included is a glossary of computer buzzwords, graphic visualizations on how microcomputers work and how and where they can be used most effectively.

Printed in a large 11×14 inch format, the *MicroShopper* includes over 125 photographs of equipment from more than 120 manufacturers with over 500 products discussed in detail. Enclose $5 in check or money order (includes postage and handling).

MicroWorld, 1425 W. 12th Place, Tempe AZ 85281.



CI-6800 memory board.

RAM Board for Exorcisor I or II

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The CI-6800 allows maximum processor throughput with the use of hidden refresh control logic on-board. Data access time is 300 nsec and cycle time is 750 nsec. On-board memory select is available in 4K increments up to 64K words of memory. Write disable switch on-board makes the RAM a ROM to the outside world.

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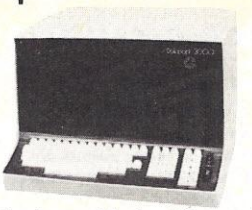

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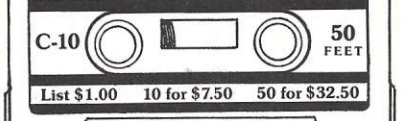

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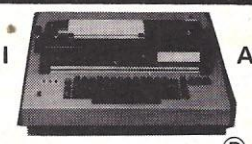
ASCII  ASCII

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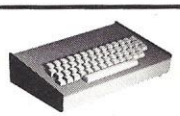

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TRS-80

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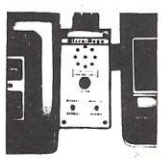

The Micro-Mega Cassette Control Unit does all this and more. You get instant manual control of the recorder at the flick of a switch. Want to find the beginning or end of a program? Flick another switch, and you'll hear it. All cables remain plugged in all the time.

The Micro-Mega Cassette Control Unit does a lot to clean up and neaten up your whole TRS-80 installation too. As shown at the left, it's in a 2½"x5" box which snuggles between the keyboard and your recorder. There is no need to move the recorder, and there no longer are any 90 degree cable bends whipping around. It's fast, neat and convenient, - and its's a bargain!

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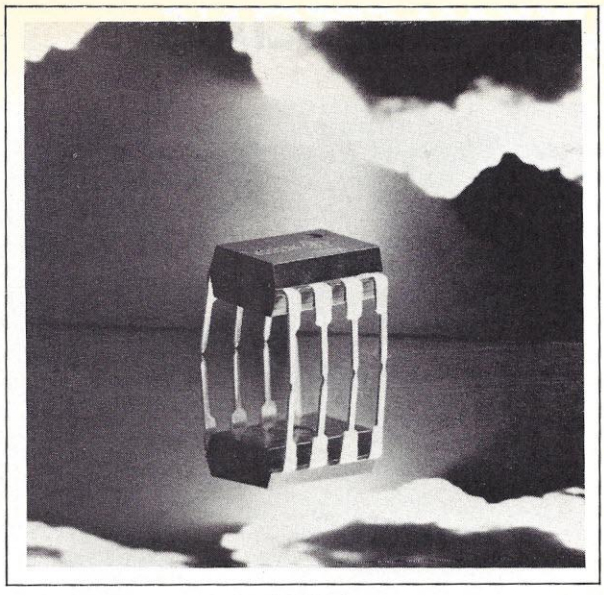

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- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
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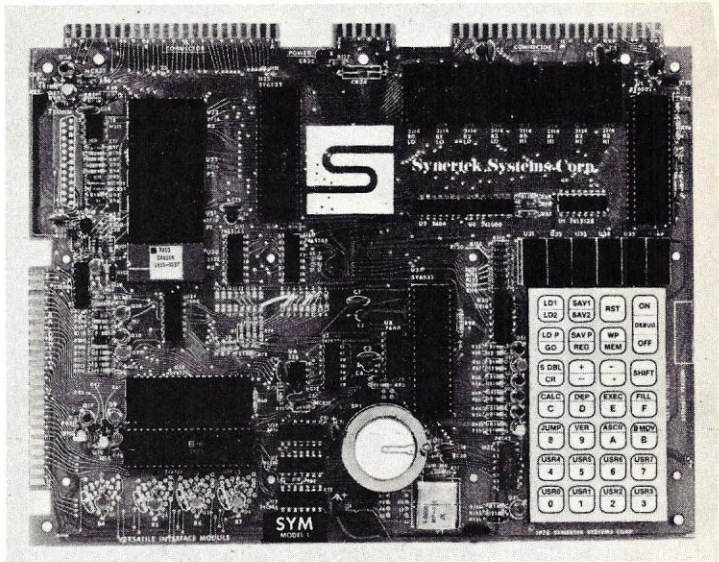
*KIM is a product of MOS Technology



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*KIM is a product of MOS Technology

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VAK-5 2708 EPROM Programmer $269.00

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Features:	TH3216	TH6416
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Baud Rates	300-9600	110-9600
Controls	Read to/from memory	Scroll up or down
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Above prices include all IC sockets

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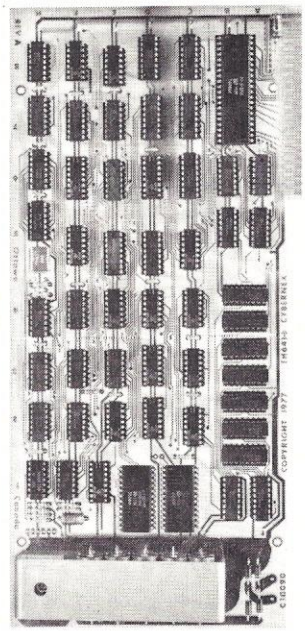

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"TH 6416 shown above"

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Accuracy: 2 ppm, .001 ppm with TV time base!
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Convert any TV set to a video monitor. Super stable circuit is glitch-free, tunable over channels 4-6. Runs on 5-15V. Recommended by many computer manufacturers. Std. video input. Complete kit, VD-1 . . . . . .$6.95

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PNP Power Tab 40W	3/$1.00
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2N3055 NPN Power	75

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TTL/RS232
Converter kit
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A complete tone decoder on a single PC Board. Features: 400 to 5000 Hz adjustable frequency range, voltage regulation. 567 IC. Useful for touch tone decoding, tone burst detection, FSK demod, signaling, and many other uses. Use 7 for 12 button touchtone decoding. Runs on 5 to 12 volts.
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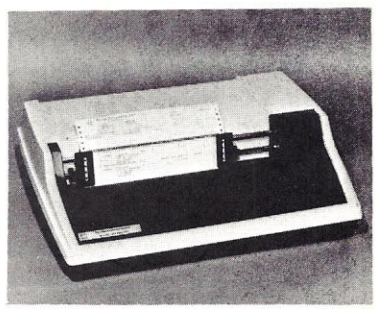

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2112-1	2.95	2.85	2.65
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2114-3 300ns.	9.95	9.75	8.25
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TMS4044	8.95	8.75	7.00
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6508 1K x 1 CMOS	7.95	7.95	7.25
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ADD RAM FOR LOWER CASE CHARACTERS AND CLEAN UP HORIZONTAL SMEAR (SEND YOUR TRS-80 MICROCOMPUTER ONLY)

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JUST SEND US YOUR TRS-80 MICROCOMPUTER AND WE DO THE REST.

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WE INSTALL *YOUR* LEVEL 2 SO YOU KEEP LEVEL 1 AND CAN USE IT BY JUST FLIPPING A SWITCH. (SEND LEVEL 2 WITH YOUR TRS-80)

$69.00

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INCREASE YOUR PROCESSING SPEED BY 30%. WITH THIS OPTION YOU CAN SWITCH-SELECT BETWEEN THE FASTER 2.66MHZ CLOCK RATE AND 1.77MHZ.

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OPERATE CRYSTAL CONTROLLED TTY WITH LEVEL 1 OR 2. WE INSTALL SWITCH SELECTABLE BAUD RATES OF 75, 110, 137.5, 150, 300, 600, 1200, 2400, 4800, 9600 OR EXTERNAL. EIA RS232 AND CURRENT LOOP OUTPUT.

PARTS AND LABOR $119.00

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YOU PROVIDE EXPANSION INTERFACE AND WE'LL INSTALL A PERTEC F D 200 MINI FLOPPY.

PARTS AND LABOR (PERTEC F D 200 MINI FLOPPY INCLUDED) FOR ONLY $425.00

SPECIALS!! DO MORE THAN ONE MOD AND SAVE

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SEND TRS-80 KEYBOARD ONLY!!

RETURN SHIPPING:
FROM ENGLAND ADD $30.00 FOR AIR, $9.50 SURFACE MAIL
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- Rechargeable batteries and charger included
- Measures DC Volts, AC Volts, Ohms and Current
- Automatic polarity, decimal and overload indication
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- Measures DC Volts, AC Volts, Ohms and Current
- Automatic polarity, decimal and overload indication
- No zero adjustment and no full-scale ohms adjust
- Battery-operated — NiCad batteries; also AC line operation.
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- 15 megahertz bandwidth.
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- Time base — .1 microsec. to 0.5 Sec/div - 21 settings ±3%.
- Battery or line operation.
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- Case size 2.7"H x 6.4"W x 7.5"D, 3 pounds.
- Parts & Labor guaranteed 1 year
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● **MS-215 Dual Trace Version of MS-15 $435.**

SALE **S-100 BUS EDGE CONNECTORS** SALE

S100-WWG 50/100 Cont. .125 ctrs. 3 LEVEL WIRE WRAP .025" sq. posts on .250 spaced rows. GOLD plated.
1-4 $4.00 | 5-9 $3.75 | 10-24 $3.50

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Other Popular Edge Connectors

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ATTN: OEM'S and Dealers, many other connectors available call or quotation.

3 LEVEL GOLD WIRE WRAP SOCKETS

Sockets purchased in multiples of 50 per type may be combined for best price.

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8 pin*	.41	.38	.35	.31	.27	.23
14 pin*	.39	.38	.36	.32	.29	.27
16 pin*	.43	.42	.39	.35	.32	.30
18 pin	.63	.58	.54	.47	.42	.36
20 pin	.80	.75	.70	.63	.58	.53
22 pin*	.90	.85	.80	.70	.61	.57
24 pin	.90	.84	.78	.68	.63	.58
28 pin	1.10	1.00	.90	.84	.76	.71
40 pin	1.50	1.40	1.30	1.20	1.04	.89

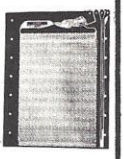
All sockets are GOLD 3 level closed entry *End and side stacable. 2 level, Solder Tail, Low Profile, Tin Sockets and Dip Plugs available. CALL FOR QUOTATION

LIQUID CRYSTAL DIGITAL CLOCK-CALENDAR

- For Auto, Home, Office
- Small in size (2x2½x½)
- Push button for seconds release for date.
- Clocks mount anywhere with either 3M double-sided tape or VELCRO, included.
- 2 MODELS AVAILABLE:
  LCD-101, portable model runs on self-contained batteries for better than a year.
  LCD-102, runs on 12 Volt system and is back-lighted.
- LCD-101 or LCD-102 your choice ..... **$34.95 ea.**
- Clear desk stand for **$2.00**

8803 MOTHER BOARD FOR S100 BUS MICRO-COMPUTERS

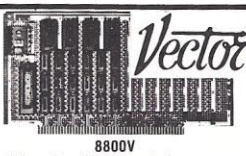
Vector



- Kit includes 12 tantalum capacitors for +5, +12, −12 buses and insulated mounting spacers.
- Wiring side shown. Component side bare epoxy glass with white markings for component locations.
- G10 epoxy glass board with 2 ounce copper, solder plated and .038 diameter holes for leads.
- Solder mask with solder windows on etched circuits to avoid accidental short circuits.
- Mounts 11 receptacles with 100 contacts (2 rows) on .125 centers with .250 row spacing. Vector part number R681-2; or mounts 10 receptacles plus interconnections to smaller mother board for expansion.
- Includes etched circuits and instructions for option of active, pull-up, or floating terminations.
- Large buses: +5V and GND (10 AMPS), ±12V or 16V (7 AMPS). Current ratings are per MIL-STD-275 with 10°C rise.
- Fits in Vector-pak enclosures.
- Fits in IMSAI 8080 microcomputer as expander board.

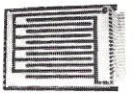
Price: $29.50

Vector **Plugboards**



8800V
Universal Microcomputer/processor plugboard, use with S-100 bus. Complete with heat sink & hardware. 5.3" x 10" x 1/16"
1-4 $19.95 | 5-9 $17.95 | 10-24 $15.96

8801-1
Same as 8800V except plain; less power buses & heat sink.
1-4 $14.95 | 5-9 $13.46 | 10-24 $11.96



3682 9.6" x 4.5"
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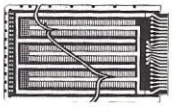
3682-2 6.5" x 4.5"
$9.81
Hi-Density Dual-In-Line Plugboard for Wire Wrap with Power & Grd. Bus Epoxy Glass 1/16" 44 pin con. spaced .156



3677 9.6" x 4.5"
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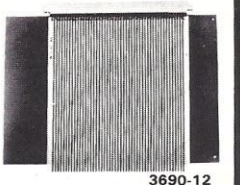
$9.74
Gen. Purpose D.I.P. Boards with Bus Pattern for Solder or Wire Wrap. Epoxy Glass 1/16" 44 pin con. spaced .156

3662 6.5" x 4.5"
$7.65
3662-2 9.6" x 4.5"
$11.45
P pattern plugboards for IC's Epoxy Glass 1/16" 44 pin con. spaced .156



3690-12 CARD EXTENDER
Card Extender has 100 contacts-50 per side on .125 centers-Attached connector-is compatible with S-100 Bus Systems..... **$25.00**
3690 6.5" 22/44 pin .156 ctrs. Extenders $12.00

1/16 Vector BOARD
.042 dia holes on 0.1 spacing for IC's

Phenolic PART NO.	SIZE	PRICE 1 - 9	10	19
64P44XXXP	4.5x6.5"	$1.49	1.34	
169P44XXXP	4.5x17"	$3.51	3.16	
Epoxy Glass				
64P44	4.5x6.5"	$1.70	1.53	
84P44	4.5x8.5"	$2.10	1.89	
169P44	4.5x17"	$4.30	3.87	
169P84	8.5x17"	$7.65	6.89	

SLIT-N-WRAP
Wraps insulated wire on .025" square posts
FOUR TIMES FASTER than regular manual wrap-post tools

P180 with two 100' spools of 28 ga. wire **$24.50**

P160-4T includes charger, wire **$75.00**

Vector
NO PRE-STRIPPING*
NO PRE-CUTTING*
SPOOL-FED WIRE*
*The spooled wire passes through the tool past a slitting edge next to the wrap post. A narrow longitudinal cut is made in the insulation where it presses the square post corner. The bared copper is indented by the sharp edge. (7 turns+ 28 contacts)
Insulation is slit where wrapped but not between terminal posts when tool straight out of the tool

"Daisy-chain" runs
Reliable and easy to use
Manual or power operation

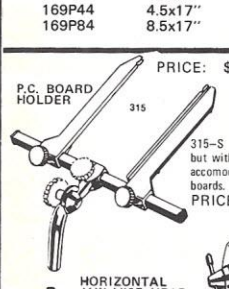
SLIT-N-WRAP WIRE NO. 28 GAGE INSULATED WIRE, 100' SPOOLS $2.75 Package
W28-2-A-Pkg. 3, Green W28-2-C-Pkg. 3, Clear
W28-2-B-Pkg. 3, Red W28-2-O-Pkg. 3, Blue

2708
8K 450 ns
EPROM
FACTORY PRIME
$ 9.00 EA.
25 + *Call For Price*

14 & 16 PIN GOLD 3 LEVEL WIRE WRAP SOCKETS

14 - G3 100 for **$30.00**
16-G3 100 for **$30.00**
50 of each for **$32.00**
Sockets are End & Side stackable, closed entry

PANAVISE



P.C. BOARD HOLDER
PRICE: $16.95

315
315–S same as 315 but with 14" bar to accomodate "S100" boards.
PRICE: **$17.95**

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PRICE: $11.95

STANDARD BASE
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PRICE: $11.95

STANDARD VISE HEAD
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PRICE: **$12.95**

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VISE HEAD Swivels and Tilts
LOCK SCREW BASE Swivels
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90

366
WIDE OPENING VISE HEAD
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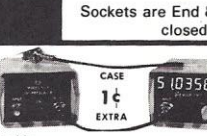


SC-5 With Rechargeable Batteries & Charger Unit $98

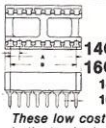
FM-7 With Rechargeable Batteries & Charger Unit $215

Features Include: • By using the new NLS SC-5 Prescaler, the range of the FM-7 Frequency Meter, which is 10 Hz to 60 MHz, may be extended to 512 MHz (the upper VHF & UHF frequency bands). • The FM-7 utilizes an LED readout, providing 7-digit resolution. • The FM-7 can be calibrated to an accuracy of 0.000001%. • The SC-5 is accurate to one part per million. • Each unit has 30 millivolts sensitivity, is battery powered and has a charger unit included. • Dimensions of each are 1.9" H x 2.7" W x 3.9" D. • The units may be obtained separately or as a "Frequency Duo." • Parts & Labor guaranteed 1 year.
Tilt stand option ..... $ 3.50
Leather case $20.00

Price Breakthrough!

$17.50
MA1003
CAR CLOCK
Bright Green Fluorescent Display Crystal Time Base Assembled, just add switches and 12 VDC.

SPECIAL



14CS2 100 for $14.00
16CS2 100 for $16.00
14 pin CS2 10 for $2.00
16 pin CS2 8 for $2.00
These low cost DIP sockets will accept **both standard width plugs and chips.**
For use with chips, the sockets offer a low profile height of only .125" above the board. These sockets are end stackable.

Vector
WRAP POST
for .042 dia. holes (all boards on this page)
T-44 pkg. 100 .. $ 2.28
T-44 pkg. 1000..... **$14.00**
A-13 hand installing tool ..... $ 2.80

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- WILL CONTROL UP TO EIGHT FLOPPIES AS CONFIGURED, WITH SIMPLE MODIFICATION WILL CONTROL UP TO 64
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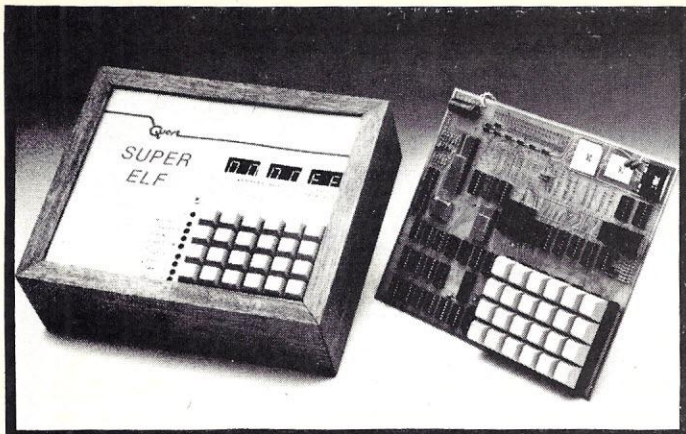

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QUEST Cosmac Super Elf Computer $106.95

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory, Tiny Basic, Ascii Keyboards, video character generation, etc.**

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are shown on several LED indicator lamps.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, input, memory protect, memory select, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector for PC cards and a 50 pin connector for the **Quest Super Expansion Board**. Power supply and sockets for **all** IC's are included in the price plus a detailed 90 page instruction manual.

Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and research and development.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Hardwood Cabinet** with drilled and labelled front panel **$24.95. NiCad Battery Backup Kit $4.95.** All kits and options also come completely assembled and tested.

Questdata, a 12 page monthly software publication for 1802 computer users is available by subscription for $12.00 per year.

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed** ($12.00 value). EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatible cassette file) another exclusive from Quest. It includes register save and readout, video graphics driver with blinking cursor and block move capability. The Super Monitor is written with subroutines allowing users to take advantage of monitor functions simply by calling them up. Improvements and revisions are easily done with the monitor. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. A Godbout 8K RAM board is available for $127.95. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at $12.50 for easy connection between the **Super Elf** and the **Super Expansion Board.**

The **Power Supply** for the Super Expansion Board is a 5 amp supply with + 8v ± 18v + 12v − 5v. Regulated voltages are +5v & +12v $29.95. Deluxe version includes the case at $39.95.

Tiny Basic for ANY 1802 System

Cassette $10.00. On ROM Monitor $38.00. Super Elf owners, 30% off. **Object code listing or paper tape with manual $5.50. Original ELF Kit Board $14.95.**

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7400N	.17
7402N	.17
7404N	.19
7409N	.23
7410N	.17
7414N	.63
7420N	.17
7422N	1.39
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7485N	.88
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7492N	.43
7493N	.43
7495N	.69
74100N	.90
74107N	.29
74121N	.34
74123N	.59
74125N	.39
74145N	.69
74150N	.95
74151N	.69
74154N	1.00
74157N	.69
74161N	.87
74162N	.87
74163N	.87
74174N	.96
74175N	.90
74190N	1.15
74192N	.87
74193N	.85
74221N	1.55
74298N	1.65
74365N	.66
74366N	.66
74367N	.66

74LS00 TTL

74LS00N	.25
74LS02N	.25
74LS04N	.25
74LS05N	.25
74LS08N	.25
74LS10N	.25
74LS13N	.40
74LS14N	.90
74LS20N	.25
74LS22N	.25
74LS28N	.41
74LS30N	.25
74LS33N	.39
74LS38N	.30
74LS74N	.35
74LS75N	.47
74LS90N	.51
74LS93N	.51
74LS95N	1.89
74LS107N	.35
74LS112N	.35
74LS113N	.35
74LS132N	.72
74LS136N	.35
74LS151N	.67
74LS155N	.67
74LS157N	.67
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LM324N	1.15
LM339N	1.55
LM340K-5	1.10
LM340K-8	1.10
LM340K-12	1.10
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CD4017	.94
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CD4023	.21
CD4024	.75
CD4025	.21
CD4026	1.51
CD4027	.36
CD4028	.79
CD4029	1.02
CD4030	.21
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CD4040	1.02
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CD4043	.63
CD4044	.63
CD4046	1.67
CD4049	.36
CD4050	.36
CD4051	1.13
CD4060	1.42
CD4066	.71
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CD4069	.40
CD4070	.40
CD4071	.21
CD4072	.21
CD4073	.21
CD4075	.21
CD4076	1.75
CD4078	.40
CD4081	.21
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74C76	1.40
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8T25	3.20
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MM5318	3.60
MM5369	2.10
MM5841	14.45
MM5865	7.95
CT7001	5.80
CT7002	8.95
CT7010	8.95
CT7015	7.25
MM5375AA/N	3.90
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7205	16.50
7207	7.50
7208	15.95
7209	4.95
DS0026CN	3.75
DS0056CN	3.75
MM53104	2.50

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6802	24.95
8080A with data	8.95
8085	27.00
Z80	29.95
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8216	2.90
8224	2.90
8228	5.35
8251	8.50
8253	10.00
8255	9.25
8257	19.50
8259	19.50
CDP1802CD	19.95
CDP1802D	25.00
CDP1861	12.95
6820	9.95
6850	12.95
6502	12.50

IC SOCKETS

Solder Tin	Low Profile
PIN 1 UP	PIN 1UP
8 .15	22 .30
14 .18	24 .35
16 .20	28 .42
18 .27	36 .58
20 .29	40 .57

3 level wire wrap gold
14 pin .25 16 pin .27
2 level 14 pin ww .20

WIRE WRAP LEVEL 3

PIN	PIN	
14	24	.86
16	28	1.00
18	40	1.23

UART/FIFO

AY5-1013	5.50
AY5-1014	7.50
3341	6.95

PROM

1702A	3.95
N82S23	2.95
N82S123	3.50
N82S126	3.75
N82S129	3.75
N82S131	3.75
N82S136	8.75
N82S137	8.75
2708	12.50
DM8577	2.90
8223	2.90
2716T1	22.50
2716 Intel	48.00

CRYSTALS

1 MHz	4.50
2 MHz	4.50
4 MHz	4.25
5 MHz	4.25
10 MHz	4.25
18 MHz	3.90
20 MHz	3.90
32 MHz	3.90
32768 MHz	4.00
1.8432 MHz	4.50
3.5795 MHz	1.20
2.0100 MHz	1.95
2.097152 MHz	4.50
2.4576 MHz	4.50
3.2768 MHz	4.50
5.0688 MHz	4.50
5.185 MHz	4.50
5.7143 MHz	4.50
6.5536 MHz	4.50
14.31818 MHz	4.50
18.432 MHz	4.50
22.1184 MHz	4.50

CONNECTORS

.44 pin edge	2.00
100 pin edge	4.50
100 pin edge WW	5.25

KEYBOARD ENCODERS

AY5-2376	$12.50
AY5-3600	13.50
74C922	5.50
74C923	5.50
HD0165-5	8.95

IC Test Clips

	1	10
Red	.55	.47
Black	.55	.47

Keyer 8043 14.50
comp. w/spec./sock.

TRANSISTORS

2N2222A	.18
2N3904	.18
2N3906	.18
2N3055	.69

CLOCK MODULES Complete alarm clocks ready to hook up with transformer and switches. Very compact with .50" and .84" digits.

MA1002A, C or E .50"	**8.95**
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Special transformer and six switches when purchased w/module	**2.95**
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RESISTORS ¼ watt 5%
10 per type .03 1000 per type .012
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56 key ASCII keyboard kit	$62.50
Fully assembled	72.50
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Fully assembled 65.00 Enclosure	14.95

LEDS

Red T018	.15
Green, Orange, Yellow T018	.20
Jumbo Red	.20
Green, Orange, Yellow Jumbo	.25
Cliplite LED Mounting Clips	8/$1.25

(specify red, amber, green, yellow, clear)

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Portable Multimeter $18.00

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I/O Board Kit	44.50
Extender Board w/connector	12.50
Video Interface board kit	125.00
16K EPROM board kit w/o PROMS	74.50
16K Static RAM board kit	395.00
North Star Floppy Disk Kit	$665.00
Additional Drive Kit	415.00

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PC board	7.50
Switches Mom. Pushbutton	.27
3 pos. slide	.25
Encoder HD0165-5	6.95
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Operates 5–18 Volt DC to 5 MHz typ. .125" LED display	**10.50**
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12V CT 250 ma wall plug	3.50
24V CT 400 ma	3.95
10V 1.2 amp wall plug	4.95
18V 6 amp	12.95

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MAN1	CA	.270	2.90
MAN3	CC	.125	.39
MAN72/74	CA/CA	.300	1.00
DL704	CC	.300	1.25
DL707/DL707R	CA	.300	1.00
DL727/728	CA/CC	.500	1.90
DL747/750	CA/CC	.600	1.95
DL750	CC	.600	1.95
FND359	CC	.357	.70
FND500/507	CC/CA	.500	1.35
FND503/510	CC/CA	.500	.90
FND800/807	CC/CA	.800	2.20
3 digit Bubble			.60
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DG8 Fluorescent			1.75
DG10 Fluorescent			1.75
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7520 Clairex photocells			.39
TIL311 Hex			9.50

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2000	mfd	45V	2.50
3200		50V	2.50
5500		25V	2.50
5800		40V	3.00
6100		40V	3.00
6100		50V	3.00
7700		50V	2.50
8000		55V	2.50
9400		65V	3.00
10000		20V	2.50
12000		30V	3.50
35000		25V	5.00
55000		25V	5.00
82000		15V	6.00
160000		10V	6.00

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DC clock with 4-.50" displays. Uses National MA-1012 module with alarm option. Includes light dimmer, crystal timebase PC boards. Fully regulated, comp. instructs. Add $3.95 for beautiful dark gray case. Best value anywhere.

RCA Cosmac VIP Kit 229.00

Video computer with games and graphics.

Not a Cheap Clock Kit $14.95

Includes everything except case. 2-PC boards. 6-.50" LED Displays. 5314 clock chip, transformer, all components and full instrucs. Green and orange displays also avail. **Same kit w/.80" displays.** Red only. **$21.95**

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Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy. Kit includes: PC board, MM5369, crystal, resistors, capacitors and trimmer.

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Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. **$7.25**

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CT7015 direct drive chip displays date and time on .6" LEDS with AM-PM indicator. Alarm/doze feature includes buzzer. Complete with all parts, power supply and instructions, less case.

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16K Static RAM Kit	265.00
24K Static RAM Kit	423.00
32K Dynamic RAM Kit	449.00
64K Dynamic RAM Kit	945.00
8K/16K Eprom Kit (less PROMS)	**$89.00**
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THE PET CONNECTION

Networks Bidirectional RS-232 interface
- Single Port $240.00
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- Cabinet $ 35.00

PET with 8K user memory **$795.00**
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RS-232 Printer Adapter — assembled board **$98.50**
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Beeper — PET controlled 'beep' **$24.95**

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EXPANDAPET - Economical 16K memory expansion for the PET (includes 1 daughter board) **$435.00**
without daughter board **$395.00**

Hams! Add a PET to your rig.

Computerize your station with Microtronics' M-65 Ham Interface and included software. You simply plug the unit into your PET and you're ready to display, transmit and receive either CW or RTTY at rates up to 100 WPM.

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This peripheral from Commodore gives you the ability to use one tape deck for input and one for output, copy files, etc.

SELECTRIC-BASED TERMINAL FOR PET

$895

We have interfaced our TC-71 to the PET. Use with the IEEE-488 bus as a printer or with the VIA User Port for bidirectional I/O. Ideal for Word Processing applications.

Sale price if bought with PET: **$795**

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This is a completely refurbished Teletype KSR-33 terminal ready to attach to your PET's interface to use as a printer.

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NEW ASCII INTERFACES for Reader/Punch

30 Day delivery on Interfaces

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- Z-80 Processor
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- User definable characters
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- Resident 4K Monitor ROM
- Dual Cassette I/O
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- Complete Operators Manual
- Only $895

Top value in our catalog, simply add a monitor and tape decks to complete the system. Can be used as a terminal. Later ROM PACs will offer Z-80 Assembly Language, APL, PILOT, Word Processing and a DOS PAC for disk-based FORTRAN and COBOL. What a system for $895.

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Assembled & tested **NOW $187**

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- 24 x 80 display
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Model 3 8K RAM $1495
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- Beautiful 128 x 128 color graphics
- 4K Graphics RAM
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TC-71 SELECTRIC TERMINALS

Top-quality printing terminal with RS-232, TTTC code. Includes desk, 130 char/line. ASCII version employs 6802 for code conversion. See our catalog for details.

- ASCII $864
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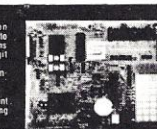
Acoustic Coupler for use with ASCII TC-71 **$159**

- 28 Double-function keypad including up to 24 "Special" functions
- Easy-to-view 6-digit hex led display
- KIM-1 hardware compatibility
- 6502 based system
- 4K byte ROM resident monitor and operating system
- Single 5 volt power
- 1K bytes of 2114 static RAM on sockets provided for immediate expansion to 4K bytes
- Enhanced software



SYM-1
From Synertek
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- Standard interfaces include:
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NCE/Compumart Inc. breaks the price barrier with a new 300 baud RS-232C acoustic coupler. For only $159 you get an assembled, tested stand alone unit which accepts the standard telephone handset, for full or half duplex operation. Complete with power supply and carrier-detect light, the unit is housed in an attractive case for desk top use.

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- Edu-BASIC cassette included
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- 8K RAM, 2K ROM

If you can't decide between a sophisticated video game and a home computer then the Interact Model One is for you. Hook it to your color TV and you've got both! You can play one of the games which are included free or you can load Edu-BASIC and write your own games. You can save programs or data using the built-in cassette tape drive. Best of all you get over $294 worth of free cassettes including:

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Edu-BASIC — Write programs
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  - Application Conn. for TTY, 2 cassettes, 2 8 big I/O ports
  - Expansion Conn. (try our KIMSI S-100 board)
  - Both connectors totally KIM-1 compatible
- Easy Power connections

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Options — 4K ROM Assembler/Text Editor
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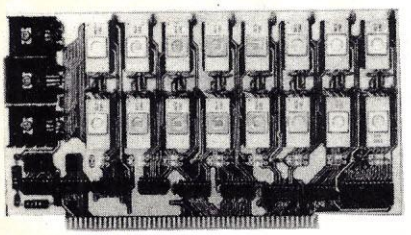
16K EPROM CARD-S 100 BUSS



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OUR BEST SELLING KIT!

USES 2708's!

Thousands of personal and business systems around the world use this board with complete satisfaction. Puts 16K of software on line at **ALL TIMES!** Kit features a top quality soldermasked and silk-screened PC board and first run parts and sockets. All parts (except 2708's) are included. Any number of EPROM locations may be disabled to avoid any memory conflicts. Fully buffered and has WAIT STATE capabilities.

OUR 450NS 2708'S ARE $8.95 EA. WITH PURCHASE OF KIT

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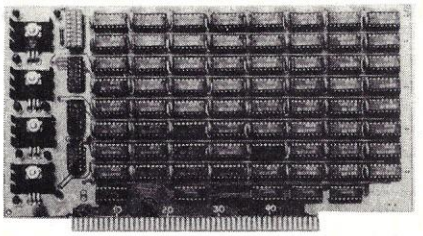

$129 KIT

Use 21L02 450 NS RAMS!

Thousands of computer systems rely on this rugged, work horse, RAM board. Designed for error-free, NO HASSLE, systems use.

KIT FEATURES:

1. Doubled sided PC Board with solder mask and silk screen layout. Gold plated contact fingers.
2. All sockets included.
3. Fully buffered on all address and data lines.
4. Phantom is jumper selectable to pin 67.
5. FOUR 7805 regulators are provided on card.

Blank PC Board w/Documentation **$29.95**
Low Profile Socket Set...**13.50**
Support IC's (TTL & Regulators) **$9.75**
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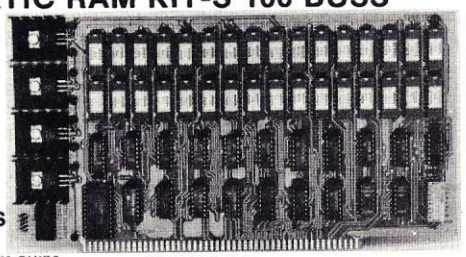
ASSEMBLED AND FULLY BURNED IN ADD $30

16K STATIC RAM KIT-S 100 BUSS

$295 KIT

FULLY STATIC, AT DYNAMIC PRICES



WHY THE 2114 RAM CHIP?

We feel the 2114 will be the next industry standard RAM chip (like the 2102 was). This means price, availability, and quality will all be good! Next, the 2114 is FULLY STATIC! We feel this is the **ONLY** way to go on the S-100 Buss! We've all heard the HORROR stories about some Dynamic Ram Boards having trouble with DMA and FLOPPY DISC DRIVES. Who needs these kinds of problems? And finally, even among other 4K Static RAM's the 2114 stands out! Not all 4K static Rams are created equal! Some of the other 4K's have **clocked** chip enable lines and various timing windows **just as critical** as Dynamic RAM's. Some of our competitor's 16K boards use these "tricky" devices. But not us! The 2114 is the ONLY logical choice for a trouble-free, straightforward design.

KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 2 amps TYPICAL from the +8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA—**$33**
LOW PROFILE SOCKET SET—**$12**
SUPPORT IC'S & CAPS—**$19.95**
ASSEMBLED & TESTED—**ADD $30**
2114 RAM'S—**8 FOR $69.95**

16K STATIC RAM KIT SWTPC (SS-50) 6800 BUSS

USES 2114 4K RAMS!

$295 COMPLETE KIT

WHY PAY MORE FOR FINNICKY DYNAMIC BOARDS?

At last an affordable static RAM board for this popular buss. Quality PC Board with solder mask and silk-screen. Fully buffered with plenty of bypassing for reliable operation. FOUR ON-BOARD REGULATORS.

16K DYNAMIC RAM CHIP

16K X 1 Bits. 16 Pin Package. Same as Mostek 4116-4. 250 NS access. 410 NS cycle time. Our best price yet for this state of the art RAM. 32K and 64K RAM boards using this chip are readily available. These are new, fully guaranteed devices by a major mfg. **VERY LIMITED STOCK!**

8 FOR $89.95

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450 NS! 2708 EPROMS

Now full speed! Prime new units from a major U.S. Mfg. 450 N.S. Access time. 1K x 8. Equiv. to 4-1702 A's in one package.

~~$15.75 ea.~~ **$9.95** ~~4 FOR $50.00~~

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MA1008A BRAND NEW!

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2 FOR $13

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- COMES WITH FULL DATA

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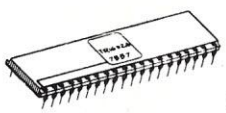
WESTERN DIGITAL UART

TR1602A. PIN FOR PIN SUB FOR AY5-1013 AND TMS6011. FOR SERIAL I/O



$2.99 EACH

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1N4148 DIODES. SILICON. Same as 1N914. New, factory prime, Full Leads.
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1N4733	5.1v	1 W Zener	.25
1N753A	6.2v	500 mW Zener	.25
1N758A	10v	"	.25
1N759A	12v	"	.25
1N5243	13v	"	.25
1N5244B	14v	"	.25
1N5245B	15v	"	.25

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4016	.35
4017	.75
4018	.75
4019	.35
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4022	.75
4023	.20
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4043	.50
4044	.65
4046	1.25
4049	.45
4050	.45
4066	.55
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7400	.10	7473	.25	74176	.85	74H72	.35
7401	.15	7474	.30	74180	.55	74H101	.75
7402	.15	7475	.35	74181	2.25	74H103	.55
7403	.15	7476	.40	74182	.75	74H106	.95
7404	.10	7480	.55	74190	1.25		
7405	.25	7481	.75	74191	.95	74L00	.25
7406	.25	7483	.75	74192	.75	74L02	.20
7407	.55	7485	.55	74193	.85	74L03	.25
7408	.15	7486	.25	74194	.95	74L04	.30
7409	.15	7489	1.05	74195	.95	74L10	.20
7410	.15	7490	.45	74196	.95	74L20	.35
7411	.25	7491	.70	74197	.95	74L30	.45
7412	.25	7492	.45	74198	1.45	74L47	1.95
7413	.25	7493	.35	74221	1.00	74L51	.45
7414	.75	7494	.75	74367	.75	74L55	.65
7416	.25	7495	.60			74L72	.45
7417	.40	7496	.80	75108A	.35	74L73	.40
7420	.15	74100	1.15	75491	.50	74L74	.45
7426	.25	74107	.25	75492	.50	74L75	.55
7427	.25	74121	.35			74L93	.55
7430	.15	74122	.55			74L123	.85
7432	.20	74123	.35	74H00	.15		
7437	.20	74125	.45	74H01	.20	74S00	.35
7438	.20	74126	.35	74H04	.20	74S02	.35
7440	.20	74132	.75	74H05	.20	74S03	.25
7441	1.15	74141	.90	74H08	.35	74S04	.25
7442	.45	74150	.85	74H10	.35	74S05	.35
7443	.45	74151	.65	74H11	.25	74S08	.35
7444	.45	74153	.75	74H15	.45	74S10	.35
7445	.65	74154	.95	74H20	.25	74S11	.35
7446	.70	74156	.70	74H21	.25	74S20	.25
7447	.70	74157	.65	74H22	.40	74S40	.20
7448	.50	74161	.55	74H30	.20	74S50	.20
7450	.25	74163	.85	74H40	.25	74S51	.25
7451	.25	74164	.60	74H50	.25	74S64	.15
7453	.20	74165	1.10	74H51	.25	74S74	.35
7454	.25	74166	1.25	74H52	.15	74S112	.60
7460	.40	74175	.80	74H53J	.25	74S114	.65
7470	.45			74H55	.20		
7472	.40						

74S133	.40
74S140	.55
74S151	.30
74S153	.35
74S157	.75
74S158	.30
74S194	1.05
74S257 (8123)	1.05
74LS00	.20
74LS01	.20
74LS02	.20
74LS04	.20
74LS05	.25
74LS08	.25
74LS09	.25
74LS10	.25
74LS11	.25
74LS20	.20
74LS21	.25
74LS22	.25
74LS32	.25
74LS37	.25
74LS38	.35
74LS40	.30
74LS42	.65
74LS51	.35
74LS74	.35
74LS86	.35
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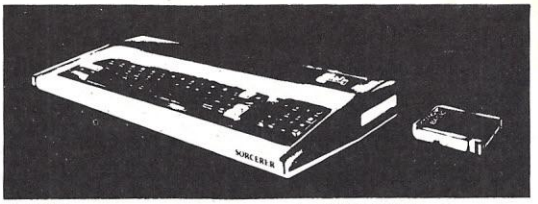

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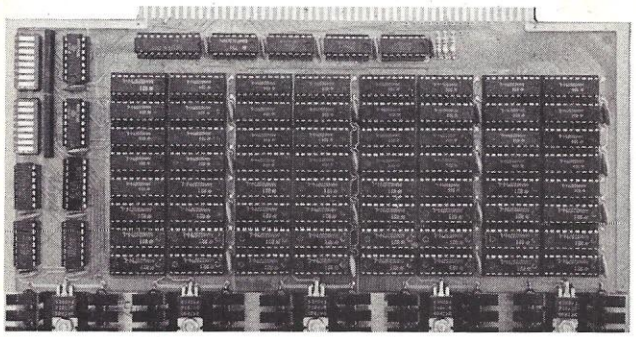

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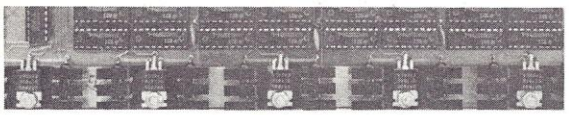

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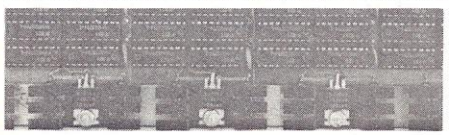

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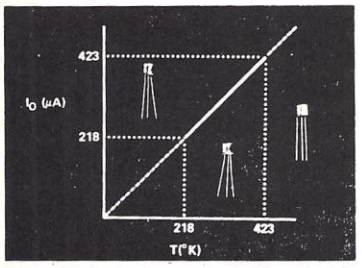

Two terminal I.C. Temperature Transducer
ANALOG DEVICES AD590J is a two terminal device producing an output current proportional to absolute temperature. Laser triming produces ± 9°C maximum error without external calibration. Calibration can reduce maximum error to only ± 2°C over −55° to +150°C range. Sensitivity is 1uA/°K. Use with +4 to +30V supply as input to digital meter in thermometer applications. Excellent for remote applications due to the very high impedance. Comes in TO-52 metal can.

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1.843 Crystal for MC14411..... $ 4.95
MM57109 Number Cruncher $18.95
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40673 Popular dual gate FET ..... $ 1.01
MM5865N Universal Timer I.C. ..... $ 9.75
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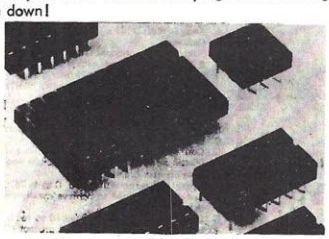

Low Profile DIP Solder Tail (Tin). End/side stackable on .1" centers!

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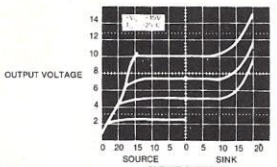
SKT-0802	8 pin	.15	.14	.12	.115
SKT-1402	14 pin	.18	.18	.15	.135
SKT-1602	16 pin	.20	.19	.17	.150
SKT-1802	18 pin	.26	.25	.24	.185
SKT-2002	20 pin	.32	.31	.29	.210
SKT-2202	22 pin	.35	.34	.33	.235
SKT-2402	24 pin	.35	.34	.33	.250
SKT-2802	28 pin	.43	.42	.41	.300
SKT-4002	40 pin	.59	.57	.55	.430

MK5102 (N)-5 Touch Tone Receiver I.C..... $34.95
600ohm to 600ohm C.T. Xfmr ..... $ 1.95
3.579545 Color Burst Xtal ..... $ 1.75
uDP416 16K Dynamic RAM (200nS) 8/ $144.00
uDP416 16K Dynamic RAM (300nS) 8/ $128.00
6502 uProcessor..... $10.95

ANALOG DEVICES
Pin Programmable Precision Voltage Reference



AD584 Output Voltage vs. Sink and Source Current

Pin Programmable Precision Voltage Reference
ANALOG DEVICES AD584JH offers pin-programmable selection of four popular output voltages: 10.000V, 7.500V, 5.000V and 2.500V. Laser trimming results in the most flexible monolithic precision reference available. Strobe input allows unit to "turn off" for use in power supply control. Output can sink or source current to greater than 10mA!
Maximum error over full temp range (0-70°c) is ± 30mV. Perfect for use in A-D converters, power supplies, calibrators, etc. 8 pin TO-5 metal can package.
AD584JH.....$6.95
Spec and Data Sheets..... .60

78P05SC 5V 10A TO-3 Reg..... $12.95
21L02-4 (MM2102AN-4L 450nS) ..... $ 1.44
Z80CPU I.C. $20.00
Z80ACPU I.C. $28.00
Z80CTC I.C. $11.00
Z80ACTC I.C. $16.00
Z80PIO I.C. $11.00
Z80APIO I.C. $16.00
25 Pin RS-232 connector Male..... $2.25
25 Pin RS-232 connector Female $3.35
DB-51226 Hood for RS-232 connector ..... $ 1.39
D-20418 Screw Lock assembly ..... $ 1.19
4801 4KX1 Static RAM $8.95, 8/ $60.00
4804 1KX4 Static RAM $8.95, 8/ $60.00

MICRO PROCESSOR COMPATIBLE A/D CONVERTERS
National Semi ADC3511 and 3711 are CMOS monolithic A/D converters. Pluse modulation analog-to-digital conversion is used and requires no external precision components except the reference voltage.

Single 5 volt operation. Operation with an isolated supply allows conversion of either polarity. Sign is automatically determined and indicated on the sign pin.

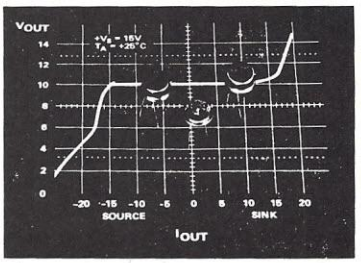
The ADC3511 and 3711 have been designed to provide address BCD data and are intended for use with micro processors and other digital systems. BCD digits are selected on demand via 2 Digit Select inputs. Digit Select inputs are latched. Start conversion input and conversion complete output are included on both types.
FEATURES
- .Single 5V Supply
- .ADC3511 3½ digits (0 to ± 1999 counts)
- .ADC3711 3¾ digits (0 to ± 3999 counts)
- .Addressed BCD Outputs
- .Easily interfaced to micro processor
- .TTL compatible

ADC-3511 (3-1/2 digit) $12.95
ADC-3711 (3-3/4 digit) $14.95
Spec for both parts..... .80

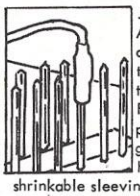
POWER OP AMP
250mA output current capability. Operates on as low as 3V. Input parameters are programmable for system optimizing. Electronic shut down allows output to float. Packaged in 8 pin mini-dip.
LM13080N..... $1.94
Specs and applications..... .60

TRI-TEK

ANALOG DEVICES
High Precision 10 Volt IC Reference



High Precision 10Volt IC Reference
ANALOG DEVICES AD581J is monolithic I.C. which produces a precise 10V (± 13.5mV) with 12 to 40V input. Ideal for many A-D converter applications as well as calibrators, power supplies, etc. 3 terminal package is as easy to use as an ordinary regulator. Can be used as precision current source, can be buffered for very large current outputs. Use as 2 terminal device produces a precision zener.
AD581J (3 terminal TO-5).....$4.98
Specs and Application sheets..... .60

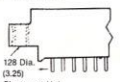


Jumper Kits for .025 Square Posts. All material for making jumpers for quick circuit changes and prototyping. Use for breadboarding, trouble shooting, field modifications. Fits standard IC socket wire/wrap posts. Excellent wiping action on gold plated box contacts.
Kit contain 10 box contacts, heat shrinkable sleeving, and 5 feet of wire plus instruction sheet.
JCK-5101....(5 double jumpers)$2.75, 4 kits/$10.00

CHARACTERISTICS **GOLD**

ELECTRICAL
Current Rating (amps) 3
Insulation Resistance (megohms) 5000 min.
Contact Resistance (milliohms) 15 max.
Dielectric Withstanding Voltage (RMS) 1500 min.
Capacitance (picofarads) 2 max.

MECHANICAL FOR .062" (1.57mm) BLADE
Insertion Force: 12 oz./position max. (3.36 N/position max.)
Withdrawal Force: 2 oz./position min. (0.56 N/position min.)



.125" × .250"

MATERIALS
Body Dielectric: Glass-filled thermoplastic polyester
Color black
Meets U.L. Flammability Classification 94V-0
Contacts: CA 725 copper-nickel-tin alloy
Gold inlay
Over min. .00100 in. nickel (0.00254 mm.):
Wire Wrap—min. .000050 in. Au (0, 00127 mm.)
Solder Tail—min. .000075 in. Au (0.00190 mm.)
Wire Wrap posts half-hard copper alloy.

EDGEBOARD CONNECTORS

Texas Instruments, world leader in metallurgical technology, is introducing its' new improved H43 connector and TRI-TEK is proud to offer it for the first time to our customers. The H43 represents the best value in the industry on this popular connector style.

Pin grid is designed to fit most of the S-100 bus machines such as Imsai, Vector, Cromemco. Will not fit Altair mother boards.

Heavy gold inlay gives you up to seven times the gold in the cirtical contact area at reduced cost. T.I. has the technology and TRI-TEK has T.I.
Solder tail H435121-50 $3.59 10/$32.00
Wire wrap H435111-50 $3.59 10/$32.00

Quantity pricing available

TRI-TEK ✓T1
7808 North 27th Avenue
Phoenix, Arizona 85021
(602) 995-9352

Charge card telephone orders ($20 min.) will be accepted 9-5:30 P.M. except weekends. Telephone (602) 995-9352. No collect calls please.

- For premium shipping (first class, special handling, etc.) add extra. Excess will be refunded.
- Please give street address for UPS shipping when possible.
- C.O.D. NO parcel post C.O.D. UPS C.O.D. Add 85¢ to order.
- Any correspondence not connected with your order, please use separate sheet and include SASE for reply.
- Claims for shortages or damaged material must be made within 10 days of receipt of package.
- Prices are subject to change without notice

(U. S. DOLLARS ONLY)

- Any refunds will be by check, not credit vouchers.
- If we should be temporarily out of stock on any item, it will be placed on back order. If we cannot ship in 30 days, you will be notified of the expected shipping date and furnished with a postage paid card with which to cancel your order if desired.
- Terms, Check, money order, credit card. Net 30 days to rated firms, schools and government agencies.
- Claims for defective material must be made within 60 days of receipt of parcel. Claim must include invoice number, date & defective parts.

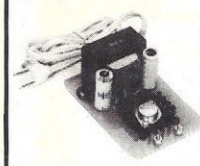
ARIZONAN'S ADD 5% TAX

Shipping and Handling
U.S. and CANADA ADD 5%
Other countries add 15%

(MINIMUM ORDER U.S. $10.00)
(FOREIGN $15.00)

Jameco ELECTRONICS (New) Kits

Regulated Power Supply



- ★ Uses LM 309K
- ★ Heat sink provided
- ★ P.C. board construction
- ★ Provides a solid 1 amp @ 5V
- ★ Includes components, hardware and instructions
- ★ Sizes: 3-1/2″ x 5″ x 2″ high

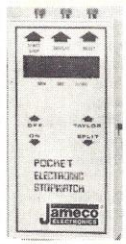
JE200 $14.95

Function Generator Kit

- ★ Provides 3 basic waveforms: sine, triangle & square wave
- ★ Frequency range from 1 Hz to 100K Hz
- ★ Output amplitude from 0-volts to over 6 volts (peak to peak)
- ★ Uses a 12V supply or a ± 6V split supply
- ★ Includes chip, P.C. board, components and instructions.

JE2206B $19.95

Digital Stopwatch Kit



- ★ Use Intersil 7205 Chip
- ★ Plated thru double-sided P.C. Board
- ★ LED display (red)
- ★ Times to 59 min. 59.59 sec. with auto reset
- ★ Quartz crystal controlled
- ★ Three stopwatches in one: single event, split (cummulative) and taylor (sequential timing)
- ★ Uses 3 penlite batteries
- ★ Size: 4.5″ x 2.15″ x .90″

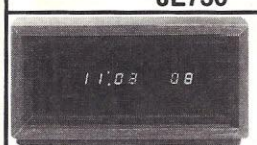
JE900 $39.95

4-Digit Clock Kit

- ★ Bright .357″ ht. red display
- ★ Sequential flashing colon
- ★ 12 or 24 hour operation
- ★ Extruded aluminum case (black)
- ★ Pressure switches for hours, minutes and hold modes
- ★ Includes all components, case and wall transformer
- ★ Size: 3-1/4″ x 1-3/4″ x 1-1/4″

JE730 $14.95

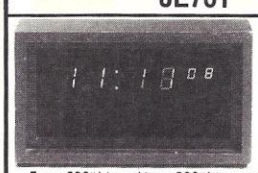
6-Digit Clock Kit



- ★ Bright .300 ht. common cathode display
- ★ Uses MM5314 clock chip
- ★ Switches for hours, minutes and hold functions
- ★ Hours easily viewable to 20 feet
- ★ Simulated walnut case
- ★ 115 VAC operation
- ★ 12 or 24 hour operation
- ★ Includes all components, case and wall transformer
- ★ Size: 6-3/4″ x 1-3/8″ x 1-3/4″

JE701 $19.95

Jumbo 6-Digit Clock Kit



- ★ Four .630″ ht. and two .300″ ht. common anode displays
- ★ Uses MM5314 clock chip
- ★ Switches for hours, minutes and hold functions
- ★ Hours easily viewable to 30 feet
- ★ Simulated walnut case
- ★ 115 VAC operation
- ★ 12 or 24 hour operation
- ★ Includes all components, case and wall transformer
- ★ Size: 6-3/4″ x 3-1/8″ x 1-3/4″

JE747 $29.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES		
8080A	CPU	$ 9.95
8212	8-Bit Input/Output	3.25
8214	Priority Interrupt Control	5.95
8216	Bi-Directional Bus Driver	3.49
8224	Clock Generator/Driver	3.95
8226	Bus Driver	3.49
8228	System Controller/Bus Driver	5.95
8238	System Controller	5.95
8251	Prog. Comm. 1/0 (USART)	7.95
8253	Prog. Interval Timer	14.95
8255	Prog. Periph. 1/0 (PPI)	9.95
8257	Prog. DMA Control	19.95
8259	Prog. Interrupt Control	19.95
6800/6800 SUPPORT DEVICES		
MC6800	MPU	$14.95
MC6802CP	MPU with Clock and Ram	24.95
MC6810API	128X8 Static Ram	5.95
MC6821	Periph. Inter. Adapt (MC6820)	7.49
MC6828	Priority Interrupt Controller	12.95
MC6830L8	1024X8 Bit ROM (MC68A30-8)	14.95
MC6850	Asynchronous Comm. Adapter	7.95
MC6852	Synchronous Serial Data Adapt.	9.95
MC6860	0-600 bps Digital MODEM	12.95
MC6862	2400 bps Modulator	14.95
MC6880A	Quad 3-State Bus. Trans. (MC8T26)	2.25
MICROPROCESSOR CHIPS—MISCELLANEOUS		
Z80(780C)	CPU	$19.95
Z80A(780-1)	CPU	24.95
CDP1802	CPU	19.95
2650	MPU	19.95
8035	8-Bit MPU w/clock, RAM, 1/0 lines	19.95
P8085	CPU	19.95
TMS9900JL	16-Bit MPU w/hardware, multiply & divide	49.95
SHIFT REGISTERS		
MM500H	Dual 25 Bit Dynamic	$.50
MM503H	Dual 50 Bit Dynamic	.50
MM504H	Dual 16 Bit Static	.50
MM506H	Dual 100 Bit Static	.50
MM510H	Dual 64 Bit Accumulator	.50
MM5016H	500/512 Bit Dynamic	.89
2504T	1024 Dynamic	3.95
2518	Hex 32 Bit Static	4.95
2522	Dual 132 Bit Static	2.95
2524	512 Static	.99
2525	1024 Dynamic	2.95
2527	Dual 256 Bit Static	2.95
2528	Dual 250 Static	4.00
2529	Dual 240 Bit Static	4.00
2532	Quad 80 Bit Static	2.95
2533	1024 Static	2.95
3341	Fifo	6.95
74LS670	4X4 Register File (TriState)	1.95
UART'S		
A-Y-5-1013	30K BAUD	5.95

MICROPROCESSOR MANUALS		
M-Z80	User Manual	$7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00
ROM'S		
2513(2140)	Character Generator(upper case)	$9.95
2513(3021)	Character Generator(lower case)	9.95
2516	Character Generator	10.95
MM5230N	2048-Bit Read Only Memory	1.95
RAM'S		
1101	256X1 Static	$1.49
1103	1024X1 Dynamic	.99
2101(8101)	256X4 Static	3.95
2102	1024X1 Static	1.75
21L02	1024X1 Static	1.95
2111(8111)	256X4 Static	3.95
2112	256X4 Static MOS	4.95
2114	1024X4 Static 450ns	9.95
2114L	1024X4 Static 450ns low power	10.95
2114-3	1024X4 Static 300ns	10.95
2114L-3	1024X4 Static 300ns low power	11.95
5101	256X4 Static	7.95
5280/2107	4096X1 Dynamic	4.95
7489	16X4 Static	1.75
74S200	256X1 Static Tristate	4.95
93421	256X1 Static	2.95
UPD414 (MK4027)	4K Dynamic 16 pin	4.95
UPD416 (MK4116)	16K Dynamic 16 pin	14.95
TMS4044-45NL	4K Static	14.95
TMS4045	1024X4 Static	14.95
2117	16,384X1 Dynamic 350ns (house marked)	9.95
MM5262	2KX1 Dynamic	4/1.00
PROM'S		
1702A	2048 FAMOS	$5.95
TMS2516 (2716)	16K* EPROM(Intel 2716) *Requires single +5V power supply	49.95
TMS2532	4KX8 EPROM	89.95
2708	8K EPROM	10.95
2716 T.I	16K** EPROM **Requires 3 voltages, —5V, +5V, +12V	29.95
5203	2048 FAMOS	14.95
6301-1(7611)	1024 Tristate Bipolar	3.49
6330-1(7602)	256 Open C Bipolar	2.95
82S23	32X8 Open Collector	3.95
82S115	4096 Bipolar	19.95
82S123	32X8 Tristate	3.95
74186	512 TTL Open Collector	9.95
74188	256 TTL Open Collector	3.95
74S287	1024 Static	2.95

NEW!! IN STOCK... POWERACE

ALL-CIRCUIT EVALUATORS WITH POWER

- 1680 solderless, plug-in tie points...will hold up to 18 14-pin DIP's.
- Breadboard elements accept all DIP sizes...including RTL, DTL, TTL and CMOS devices. TO-5's and discretes with leads up to .032″ dia.
- All connections to/from switches, indicators, power supplies and meters are made via solderless, plug-in, tie-point blocks on control panels.
- Interconnect with any solid 20 to 30 AWG wire.
- Breadboard elements are mounted on ground plane-s...ideal for high-frequency and high-speed/low-noise circuits.
- Short-circuit-proof fused power supplies.
- Operate on 110 to 130 VAC at 60 Hz
- Space-age compact styling and high-grade components permit convenient, organized and quick prototyping.
- All models are 7.5″ wide 11.5″ deep and 4.0″ high (rear) 0.75″ high (front) and weigh approx. 2.5 lbs.

POWERACE 101 -General purpose model for prototyping all types of circuit.
#923101 $ 84.95

POWERACE 102 -Complete digit prototyping lab with built-in logic probe
#923102 $114.95

POWERACE 103 -Triple-output power supply for prototyping both linear and digit circuits.
#923103 $124.95

B&K PRECISION 3½-Digit Portable DMM

- Overload Protected
- .3″ high LED Display
- Battery or AC operation
- Auto Zeroing
- 1mv. 1Va. 0.1 ohm resolution
- Overange reading
- 10 meg input impendence
- DC Accuracy 1% typical

Ranges: DC Voltage - 0-1000V/ AC Voltage 0-1000V
Freq. Response 50-400 HZ
DC/AC Current: 0-100mA
Resistance 0-10 meg ohm
Size 6 4″ x 4 4″ x 2″

Model 2800 $99.95
Comes with test leads, operating manual and spare fuse

Accessories:

AC Adapter BC-28	$9.00
Rechargeable Batteries BP-26	20.00
Carrying Case LC-28	7.50

CSC 100 MHz 8-Digit Counter

CONTINENTAL SPECIALTIES CORPORATION

- 20 Hz-100 MHz Range
- .6″ LED Display
- Crystal-controlled timebase
- Fully Automatic
- Portable — completely self-contained
- Size — 1.75″ x 7.38″ x 5.63″
- Four power souces, i.e. batteries, 110 or 220V with charger 12V with auto lighter adapter and external 7.2-10V power supply

MAX-100 $134.95

ACCESSORIES FOR MAX 100:

Mobile Charger Eliminator use power from car battery	Model 100 — CLA $3.95
Charger/Eliminator use 110 V AC	Model 100 — CAI $9.95

(New) CSC Mini-Max 6 Digit 50MHz Frequency Counter

- Guaranteed frequency range of 100 Hz to 50 MHz
- Full 6 digit display with antiglare window
- Fully automatic-range, polarity, slope, trigger, input level switching not required.
- Lead-zero blanking—All zeros to the left of the first non-zero digit are blanked. Kilo Hertz and Mega Hertz decimal points automatically light up when the unit is turned on.
- Built in input overvoltage protection.
- Use 9V Battery or 110/220V power.
- Complete with mini antenna.
- Lightweight — Only 8oz.

MINI-MAX $89.95

Accessories For Mini-Max

Part No.	Description	Price
MM-A4	Antenna	$ 3.95
MM-C5	Carrying case	5.95
MM-IPC	Input cable with clip leads	3.95
MM-AC2	110V adapter	9.95
MM-AC3	220V adapter	9.95

$5.00 Minimum Order — U.S. Funds Only
California Residents — Add 6% Sales Tax

Spec Sheets — 25¢
1979 Catalog Available—Send 41¢ stamp

NEW 1979 Catalog

Jameco ELECTRONICS
a division of JAMES ELECTRONICS of California

PHONE ORDERS WELCOME (415) 592-8097

MAIL ORDER ELECTRONICS — WORLDWIDE
1021 HOWARD AVENUE, SAN CARLOS, CA 94070
Advertised Prices Good Thru January

The Incredible "Pennywhistle 103"

$139.95 Kit Only

The Pennywhistle 103 is capable of recording data to and from audio tape without critical speed requirements for the recorder and it is able to communicate directly with another modern and terminal for telephone "hamming" and communications. In addition, it is free of critical adjustments and is built with non-precision, readily available parts.

Data Transmission Method .....Frequency-Shift Keying, full-duplex (half-duplex selectable).
Maximum Data Rate.....300 Baud.
Data Format .....Asynchronous Serial (return to mark level required between each character).
Receive Channel Frequencies ...2025 Hz for space; 2225 Hz for mark.
Transmit Channel Frequencies ..Switch selectable: Low (normal) = 1070 space, 1270 mark; High = 025 space, 2225 mark.
Receive Sensitivity .....–46 dbm accoustically coupled.
Transmit Level .....–15 dbm nominal. Adjustable from –6 dbm to –20 dbm.
Receive Frequency Tolerance ...Frequency reference automatically adjusts to allow for operation between 1800 Hz and 2400 Hz.
Digital Data Interface.....EIA RS-232C or 20 mA current loop (receiver is optoisolated and non-polar).
Power Requirements .....120 VAC, single phase, 10 Watts.
Physical.....All components mount on a single 5″ by 9″ printed circuit board. All components included.

Requires a VOM, Audio Oscillator, Frequency Counter and/or Oscilloscope to align.

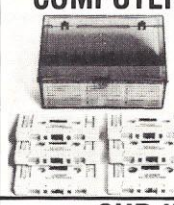
TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K. Kit comes complete with:
* 8 each UPD416 (16K Dynamic Rams)
* Documentation for conversion

TRS-16K $115.00

Special Offer - Order both your TRS-16K and the Sup'R' MOD II Interface kit together (retail value $144.95) **for only $139.95**

COMPUTER CASSETTES



- ★ 6 EACH 15 MINUTE HIGH QUALITY C-15 CASSETTES
- ★ PLASTIC CASE INCLUDED 12 CASSETTE CAPACITY
- ★ ADDITIONAL CASSETTES AVAILABLE #C-15-$2.50 ea

CAS-6 $14.95
(Case and 6 Cassettes)

SUP 'R' MOD II

UHF Channel 33 TV Interface Unit Kit

Wide Band B/W or Color System

- ★ Converts TV to Video Display for home computers, CCTV camera, Apple II, works with Cromeco Dazzler, SOL-20, IRS-80, Challenger, etc.
- ★ MOD II is pretuned to Channel 33 (UHF).
- ★ Includes coaxial cable and antenna transformer.

MOD II $29.95 Kit

Custom Cables & Jumpers

DB 25 Series Cables

Part No.	Cable Length	Connectors	Price
DB25P-4-P	4 Ft.	2-DP25P	$15.95 ea.
DB25P-4-S	4 Ft.	1-DP25P/1-25S	$16.95 ea.
DB25S-4-S	4 ft.	2-DP25S	$17.95 ea.

Dip Jumpers

DJ14-1	1 ft.	1-14 Pin	$1.59 ea.
DJ16-1	1 ft.	1-16 Pin	1.79 ea.
DJ24-1	1 ft.	1-24 Pin	2.79 ea.
DJ14-1-14	1 ft.	2-14 Pin	2.79 ea.
DJ16-1-16	1 ft.	2-16 Pin	3.19 ea.
DJ24-1-16	1 ft.	2-24 Pin	4.95 ea.

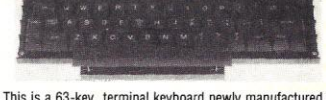
For Custom Cables & Jumpers, See JAMECO 1979 Catalog for Pricing

CONNECTORS

25 Pin-D Subminiature

DB25P(as pictured)	PLUG	$2.95
DB25S	SOCKET	3.50
DB51226-1	Cable Cover for DB25 P or S	1.75

63-Key Unencoded Keyboard



This is a 63-key, terminal keyboard newly manufactured by a large computer manufacturer. It is unencoded with SPST keys, unattached to any kind of PC board. A very solid molded plastic 13 x 4″ base suits most application. IN STOCK **$29.95/each**

Hexadecimal Unencoded Keypad

19-key pad includes 1-10 keys, ABCDEF and 2 optional keys and a shift key. **$10.95/each**

7400 TTL

SN7400N	.16
SN7401N	.18
SN7402N	.18
SN7403N	.18
SN7404N	.18
SN7405N	.20
SN7406N	.29
SN7407N	.29
SN7408N	.20
SN7409N	.20
SN7410N	.18
SN7411N	.25
SN7412N	.25
SN7413N	.40
SN7414N	.70
SN7416N	.25
SN7417N	.25
SN7420N	.20
SN7421N	.29
SN7422N	.39
SN7423N	.25
SN7425N	.29
SN7426N	.29
SN7427N	.25
SN7429N	.39
SN7430N	.20
SN7432N	.25
SN7437N	.25
SN7438N	.25
SN7439N	.25
SN7440N	.20
SN7441N	.89
SN7442N	.49
SN7443N	.75
SN7444N	.75
SN7445N	.75
SN7446N	.69
SN7447N	.59
SN7448N	.79
SN7450N	.20
SN7451N	.20
SN7453N	.20
SN7454N	.20
SN7459A	.25
SN7460N	.20

SN7470N	.29
SN7472N	.29
SN7473N	.35
SN7474N	.35
SN7475N	.49
SN7476N	.35
SN7479N	5.00
SN7480N	.50
SN7482N	.99
SN7483N	.59
SN7485N	.79
SN7486N	.35
SN7489N	1.75
SN7490N	.45
SN7491N	.59
SN7492N	.43
SN7493N	.43
SN7494N	.65
SN7495N	.65
SN7496N	.65
SN7497N	3.00
SN74100N	.89
SN74107N	.35
SN74109N	.59
SN74116N	1.95
SN74121N	.35
SN74122N	.39
SN74123N	.49
SN74125N	.49
SN74126N	.49
SN74132N	.75
SN74136N	.75
SN74141N	.79
SN74142N	2.95
SN74143N	2.95
SN74144N	2.95
SN74145N	.79
SN74147N	1.95
SN74148N	1.29
SN74150N	.89
SN74151N	.59
SN74152N	.59
SN74153N	.59
SN74154N	.99
SN74155N	.79
SN74156N	.79
SN74157N	.65

SN74160N	.89
SN74161N	.89
SN74162N	1.95
SN74163N	.89
SN74164N	.89
SN74165N	.89
SN74166N	1.25
SN74167N	1.95
SN74170N	1.59
SN74172N	6.00
SN74173N	1.25
SN74174N	.89
SN74175N	.79
SN74176N	.79
SN74177N	.79
SN74179N	1.95
SN74180N	.79
SN74181N	1.95
SN74182N	.79
SN74184N	1.95
SN74185N	1.95
SN74186N	9.95
SN74188N	3.95
SN74190N	1.25
SN74191N	1.25
SN74192N	.79
SN74193N	.79
SN74194N	.89
SN74195N	.69
SN74196N	.89
SN74197N	.89
SN74198N	1.49
SN74199N	1.49
SN74S200	4.95
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SN74279N	.79
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CD4018	.99
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CD4020	1.19
CD4021	1.39
CD4022	1.19
CD4023	.23
CD4024	.79
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CD4026	2.25
CD4027	.69

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CD4029	1.19
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CD4042	.99
CD4043	.89
CD4044	.89
CD4046	1.79
CD4047	2.50
CD4048	1.35
CD4049	.49
CD4050	.49
CD4051	1.19
CD4053	1.19
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CD4060	1.49
CD4066	.79
CD4068	.39
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CD4515	2.95
CD4518	1.29
CD4520	1.29
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74C73	.89
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74C93	1.95
74C95	1.95
74C107	1.25
74C151	2.90
74C154	3.00
74C157	2.15
74C160	2.49
74C161	2.49

74C163	2.49
74C164	2.49
74C173	2.60
74C192	2.49
74C193	2.49
74C195	2.49
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LM319N	1.30
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LM320K-5.2	1.35
LM320K-12	1.35
LM320K-15	1.35
LM320K-18	1.35
LM320K-24	1.35
LM320T-5	1.25
LM320T-5.2	1.25
LM320T-8	1.25
LM320T-12	1.25
LM320T-15	1.25
LM320T-18	1.25
LM320T-24	1.25
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LM339N	.99
LM340K-5	1.35
LM340K-6	1.35
LM340K-8	1.35
LM340K-12	1.35
LM340K-15	1.35

LM340K-18	1.35
LM340K-24	1.35
LM340T-5	1.25
LM340T-6	1.25
LM340T-8	1.25
LM340T-12	1.25
LM340T-15	1.25
LM340T-18	1.25
LM340T-24	1.25
LM358N	1.00
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LM3053N	1.50
LM3065N	1.49
LM3900N(3401)	.49
LM3905N	.89
LM3909N	1.25
MC5558V	.59
8038B	4.95
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75451CN	.39
75452CN	.39
75453CN	.39
75454CN	.39
75491CN	.79
75492CN	.89
75493N	.89
75494CN	.89
RC4136	1.25
RC4151	5.95
RC4194	5.95
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74LS00TTL

74LS00	.23
74LS01	.23
74LS02	.23
74LS03	.23
74LS04	.29
74LS05	.29
74LS08	.23
74LS09	.29
74LS10	.23
74LS11	.60
74LS13	.49
74LS14	.99
74LS15	.29
74LS20	.23
74LS21	.29
74LS22	.29
74LS26	.29
74LS27	.29
74LS28	.29
74LS30	.23
74LS32	.29
74LS37	.35
74LS40	.29
74LS42	.69

74LS47	.69
74LS51	.23
74LS54	.23
74LS55	.23
74LS73	.35
74LS74	.35
74LS75	.49
74LS76	.35
74LS78	.39
74LS83	.75
74LS85	.99
74LS86	.35
74LS90	.49
74LS92	.59
74LS93	.59
74LS95	.79
74LS96	.89
74LS107	.35
74LS109	.35
74LS112	.35
74LS123	.99
74LS125	.69
74LS132	.79
74LS136	.39

74LS138	.69
74LS139	.69
74LS151	.69
74LS155	.69
74LS157	.69
74LS160	.89
74LS161	.89
74LS162	.89
74LS163	.89
74LS164	.99
74LS175	.79
74LS181	2.49
74LS190	.89
74LS191	.89
74LS192	.89
74LS193	.89
74LS194	.89
74LS195	.89
74LS253	.79
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74LS368	.59
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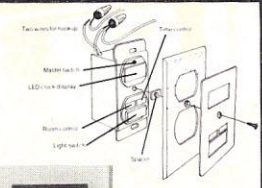
Electronic Home Security Timer

Vigilite

A microprocessor-based pre-programmed light control that fits into a home wall socket, replacing the standard on/off light switch. Discourages intruders and burglars by turning lights on and off in a "real-life" pattern while you're away.

Unlike other electromechanical timers Vigilite can simulate the lighting patterns of five different rooms as selected by the user. Vigilite can also control over-head lights, which other timers cannot. Three Vigilite units, simulating kitchen, bathroom, and bedroom lighting can give a home ultimate protection, because the user chooses a lighting pattern that depicts his real life pattern. He then sets the Vigilite clock and room pattern accordingly. (See bar chart below.) The house actually looks occupied, although no one is home.

Easy to install, the Vigilite unit contains an accurate digital LED clock, plus pre-programmed independent lighting patterns for bedroom, bathroom, kitchen, living room, and outside porch lights. All-solid-state components assure the user long product life and reliability.



Part Number VGL-1

$39.95 ea.

Technical Specifications

1) Electrical requirement—120 VAC, 60Hz, 2½ Amps.
2) For use with permanently installed incandescent 40 W to 300 W light fixtures—single pole circuits.
3) Cannot be used to control television, appliances, or other motor driven equipment.
4) One vigilite unit required for each room circuit

DISCRETE LEDS

.200" dia.				.125" dia.		
XC556R	red	5/$1		XC209R	red	5/$1
XC556G	green	4/$1		XC209G	green	4/$1
XC556Y	yellow	4/$1		XC209Y	yellow	4/$1
XC556C	clear	4/$1				
.200" dia.				.185" dia.		
XC22R	red	5/$1		XC526R	red	5/$1
XC22G	green	4/$1		XC526G	green	4/$1
XC22Y	yellow	4/$1		XC526Y	yellow	4/$1
.170" dia.				XC526C	clear	4/$1
MV10B	red	4/$1				
.085" dia.				.190" dia.		
MV50	red	6/$1		XC111R	red	5/$1
INFRA-RED LED				XC111G	green	4/$1
1/4"x1/4"x1/16" flat				XC111Y	yellow	4/$1
5/$1				XC111C	clear	4/$1

TIMEX T1001
LIQUID CRYSTAL DISPLAY
FIELD EFFECT

4 DIGIT — .5" CHARACTERS
THREE ENUNCIATORS
2.00" X 1.20" PACKAGE
INCLUDES CONNECTOR

T1001-Transmissive	**$7.95**
T1001A-Reflective	**8.25**

DISPLAY LEDS

TYPE	POLARITY	HT	PRICE	TYPE	POLARITY	HT	PRICE
MAN 1	Common Anode-red	.270	2.95	MAN 6730	Common Anode-red ± 1	.560	.99
MAN 2	5 x 7 Dot Matrix-red	.300	4.95	MAN 6740	Common Cathode-red-D.D.	.560	.99
MAN 3	Common Cathode-red	.125	.25	MAN 6750	Common Cathode-red ± 1	.560	.99
MAN 4	Common Cathode-red	.187	1.95	MAN 6760	Common Anode-red	.560	.99
MAN 7G	Common Anode-green	.300	1.25	MAN 6780	Common Cathode-red	.560	.99
MAN 7Y	Common Anode-yellow	.300	.99	DL701	Common Anode-red ± 1	.300	.99
MAN 72	Common Anode-red	.300	.99	DL704	Common Cathode-red	.300	.99
MAN 74	Common Cathode-red	.300	1.25	DL707	Common Anode-red	.300	.99
MAN 82	Common Anode-yellow	.300	.99	DL728	Common Cathode-red	.500	1.49
MAN 84	Common Cathode-yellow	.300	.99	DL741	Common Anode-red	.600	1.25
MAN 3620	Common Anode-orange	.300	.99	DL746	Common Anode-red ± 1	.630	1.49
MAN 3630	Common Anode-orange ± 1	.300	.99	DL747	Common Anode-red	.600	1.49
MAN 3640	Common Cathode-orange	.300	.99	DL749	Common Cathode-red ± 1	.630	1.49
MAN 4610	Common Anode-orange	.300	.99	DL750	Common Cathode-red	.600	1.49
MAN 4640	Common Cathode-orange	.400	.99	DL33B	Common Cathode-red	.110	.35
MAN 4710	Common Anode-red	.400	.99	FND70	Common Cathode	.250	.69
MAN 4730	Common Anode-red ± 1	.400	.99	FND358	Common Cathode ± 1	.357	.99
MAN 4740	Common Cathode-red	.400	.99	FND359	Common Cathode	.357	.75
MAN 4810	Common Anode-yellow	.400	.99	FND503	Common Cathode(FND500)	.500	.99
MAN 4840	Common Cathode-yellow	.400	.99	FND507	Common Anode (FND510)	.500	.99
MAN 6610	Common Anode-orange-D.D.	.560	.99	5082-7730	Common Anode-red	.300	1.30
MAN 6630	Common Anode-orange ± 1	.560	.99	HDSP-3400	Common Anode-red	.800	2.10
MAN 6640	Common Cathode-orange-D.D.	.560	.99	HDSP-3403	Common Cathode red	.800	2.10
MAN 6650	Common Cathode-orange ± 1	.560	.99	5082-7300	4 x 7 sgl. Digit-RHDP	.600	19.95
MAN 6660	Common Anode-orange	.560	.99	5082-7302	4 x 7 Sgl. Digit-LHDP	.600	19.95
MAN 6680	Common Cathode-orange	.560	.99	5082-7304	Overrange character (±1)	.600	15.00
MAN 6710	Common Anode-red-D.D.	.560	.99	5082-7340	4 x 7 Sgl. Digit-Hexadecimal	.600	22.50

RCA LINEAR

CA3013T	2.15	CA3082N	2.00
CA2023T	2.56	CA3083N	1.60
CA3035T	2.48	CA3086N	.85
CA3039T	1.35	CA3089N	3.75
CA3046N	1.30	CA3130T	1.39
CA3059N	3.25	CA3140T	1.25
CA3060N	3.25	CA3160T	1.25
CA3080T	.85	CA3401N	.49
CA3081N	2.00	CA3600N	3.50

CALCULATOR CHIPS/DRIVERS

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MM5738	2.95
DM8864	2.00
DM8865	1.00
DM8887	.75
DM8889	.75
9374 7 seg. C.A. LED driver	1.50

CLOCK CHIPS

MM5309	$4.95
MM5311	4.95
MM5312	4.95
MM5314	4.95
MM5316	6.95
MM5318	9.95
MM5369	2.95
MM5387/1998A	4.95
MM5841	9.95

MOTOROLA

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MC3022P	2.95
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MC4016(74416)	7.50
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IC SOLDERTAIL — LOW PROFILE (TIN) SOCKETS

	1-24	25-49	50-100
8 pin LP	.$17	.16	.15
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	$ .37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL STANDARD (TIN)

	1-24	25-49	50-100
14 pin ST	$.27	.25	.24
16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	$ .99	.90	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

SOLDERTAIL STANDARD (GOLD)

	1-24	25-49	50-100
8 pin SG	$.30	.27	.24
14 pin SG	.35	.32	.29
16 pin SG	.38	.35	.32
18 pin SG	.52	.47	.43
24 pin SG	$ .70	.63	.57
28 pin SG	1.10	1.00	.90
36 pin SG	1.65	1.40	1.26
40 pin SG	1.75	1.59	1.45

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-24	25-49	50-100
8 pin WW	$.39	.35	.31
10 pin WW	.45	.41	.37
14 pin WW	.39	.38	.37
16 pin WW	.43	.42	.41
18 pin WW	.75	.68	.62
22 pin WW	$ .95	.85	.75
24 pin WW	1.05	.95	.85
28 pin WW	1.40	1.25	1.10
36 pin WW	1.59	1.45	1.30
40 pin WW	1.75	1.55	1.40

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ASST. 1	5 ea.	10 OHM / 27 OHM	12 OHM / 33 OHM	15 OHM / 39 OHM	18 OHM / 47 OHM	22 OHM / 56 OHM	50 PCS	$1.75
ASST. 2	5 ea.	68 OHM / 180 OHM	82 OHM / 220 OHM	100 OHM / 270 OHM	120 OHM / 330 OHM	150 OHM / 390 OHM	50 PCS	1.75
ASST. 3	5 ea.	470 OHM / 1.2K	560 OHM / 1.5K	680 OHM / 1.8K	820 OHM / 2.2K	1K / 2.7K	50 PCS	1.75
ASST. 4	5 ea.	3.3K / 8.2K	3.9K / 10K	4.7K / 12K	5.6K / 15K	6.8K / 18K	50 PCS	1.75
ASST. 5	5 ea.	22K / 56K	27K / 68K	33K / 82K	39K / 100K	47K / 120K	50 PCS	1.75
ASST. 6	5 ea.	150K / 390K	180K / 470K	220K / 560K	270K / 680K	330K / 820K	50 PCS	1.75
ASST. 7	5 ea.	1M / 2.7M	1.2M / 3.3M	1.5M / 3.9M	1.8M / 4.7M	2.2M / 5.6M	50 PCS	1.75

ASST. 8R Includes Resistor Assortments 1-7 (350 PCS.) **$9.95 ea.**

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1N752	5.6	400m	4/1.00
1N753	6.2	400m	4/1.00
1N754	6.8	400m	4/1.00
1N757	9.0	400m	4/1.00
1N759	12.0	400m	4/1.00
1N959	8.2	400m	4/1.00
1N965	15	400m	4/1.00
1N5232	5.6	500m	28
1N5234	6.2	500m	28
1N5235	6.8	500m	28
1N5236	7.5	500m	28
1N5242	12	500m	28
1N5245	15	500m	28
1N456	25	40m	6/1.00
1N458	150	7m	6/1.00
1N485A	180	10m	5/1.00
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1N4007	1000 PIV 1 AMP		10/1.00
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1N4154	35	10m	12/1.00
1N4305	75	25m	15/1.00
1N4734	5.6	1w	28
1N4735	6.2	1w	28
1N4736	6.8	1w	28
1N4738	8.2	1w	28
1N4742	12	1w	28
1N4744	15	1w	28
1N1183	50 PIV 35 AMP		1.60
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4.7/25V	.15	.13	.10	1.0/25V	.16	.14	.11
10/25V	.15	.13	.10	1.0/50V	.16	.14	.11
10/50V	.16	.14	.12	4.7/16V	.15	.13	.10
22/25V	.17	.15	.12	4.7/25V	.15	.13	.10
22/50V	.24	.20	.18	4.7/50V	.16	.14	.11
47/25V	.19	.17	.15	10/16V	.14	.12	.09
47/50V	.25	.21	.19	10/25V	.15	.13	.10
100/25V	.24	.20	.18	10/50V	.16	.14	.12
100/50V	.35	.30	.28	47/50V	.24	.21	.19
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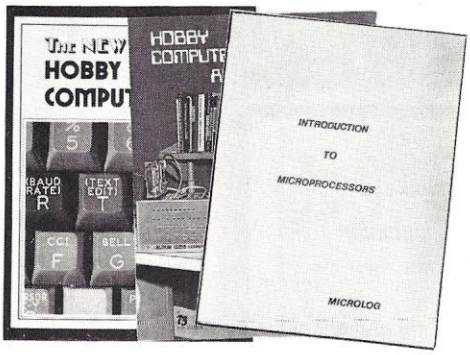

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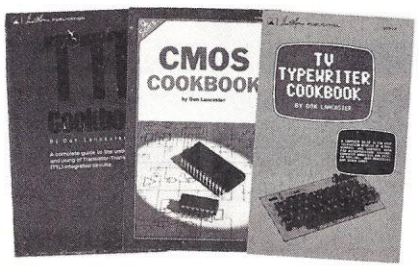

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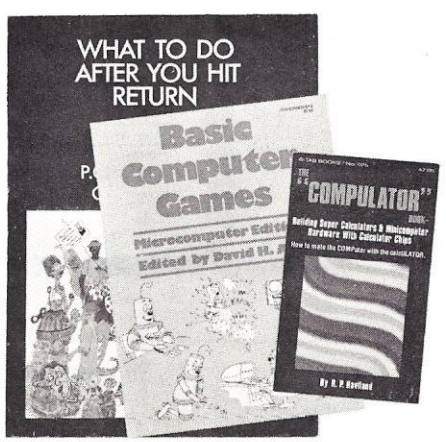

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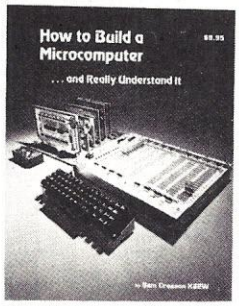

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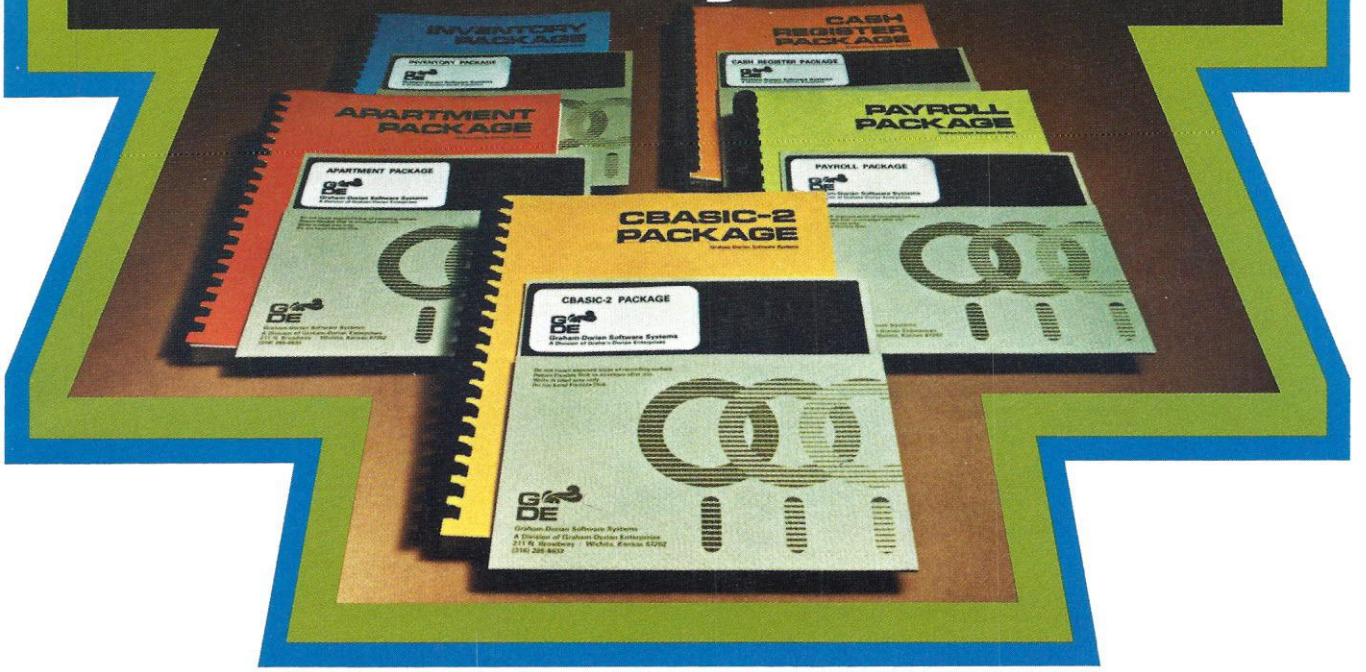
Programs
you can use in your business... ready to go now!



Our programs will let you realize the full potential of your hardware.

We developed these programs because we needed them in our businesses, and, try as we might, could not purchase them. They're on-line now, working for us and others around the country.

As users ourselves we know the problems from your perspective — not just as a manufacturer of software. The bugs are out and they're ready now to go to work helping make your life easier, keeping you in better control of your business.

Our first four program packages are: • **Apartment Management** • **Cash Register** • **Inventory** • **Payroll**

Here's a typical program

To give you an idea of the thoroughness of these programs, here's a summary of what the inventory package does for you. Gives a detailed listing of items in inventory and itemizes all goods sold from inventory, including which sales person sold what, when it sold and for how much ... recaps on one sheet this same inventory activity information ... investigates and changes any information in inventory, on request ... prints list of items to be re-ordered ... provides profit analysis comparing sales personnel and/or various products. And it can be inter-connected with our cash register package as well, for total program management.

Each of our initial programs is conceived, proven and offered with this same exacting thoroughness and attention to detail.

We stay with you after the sale

We're in this for the long haul and our support program is dedicated to that objective. Registered program owners receive:

• Periodic newsletters which include users' ideas and information exchange, plus tips to owners on further increasing benefits of the package through updated operational flexibility.

• Availability of software technicians to provide immediate answers to questions, via phone or mail.

• Customer rewrites and adaptations available on request, at added cost.

CBASIC-2 free

It takes the world's most powerful commercial basic to run our programs and we deliver it to you free.

Each of our program packages contains a disk with CBASIC-2 Compiler, CBASIC-2 Run Command and your Graham-Dorian software programs in INT and BAS file form. You also receive User's Manuals and Hard Copy Source Listing. At a price which pays for itself!

CBASIC-2 was developed and written by Software Systems, the people who wrote CBASIC, and includes many powerful enhancements.* All systems are compatible with any Z-80 or 8080 CP/M™ system. They are deliverable in standard eight-inch disk — either double or single density — or mini-floppy disk.

Give us a call or fill out the Reader Service Card in this issue. We promise a response within 24 hours of receipt. That's the kind of information service we expect, and know you do too.

*CBASIC-2 may be purchased separately from Graham-Dorian Software Systems for $89.95.

Master Charge and Visa cards accepted

Graham-Dorian Software Systems
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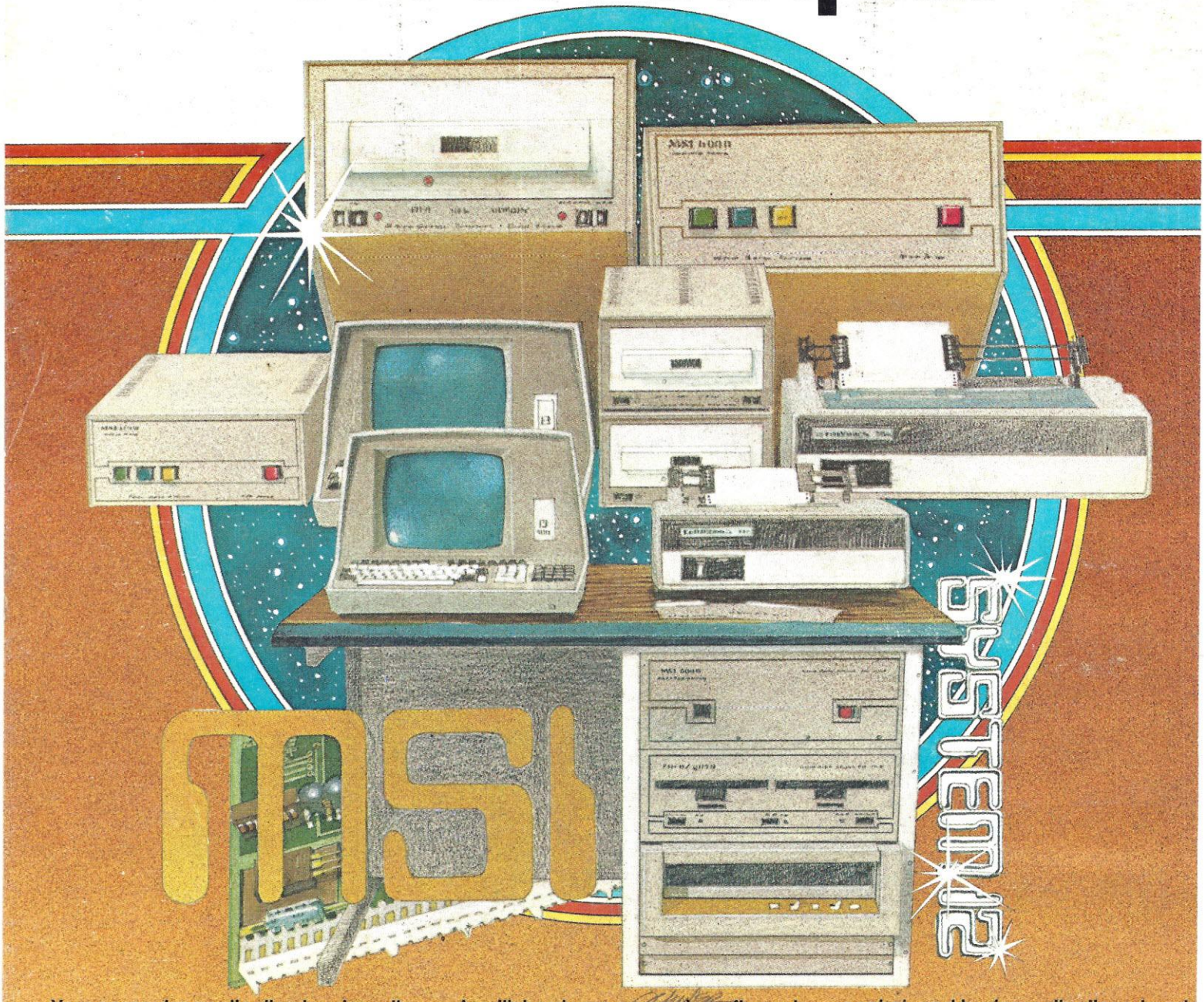
All Systems Are Not Created Equal



Your computer application is unique. It differs from all others. It is because not all applications are equal that MSI has developed a variety of computer systems.

At the heart of every MSI System is the powerful MSI 6800 Computer, one of the fastest and most versatile available. Depending on the System you select, the MSI 6800 has from 16K to 56K of RAM. Mass memory storage in MSI Systems range from 315K bytes in the System 1 to over 76 megabytes in our most powerful System 76.

In addition to the computer and memory subsystem, MSI Systems include a CRT terminal and high speed character printer. The System 12 and 76 are housed in a compact desk unit.

As with hardware, computer software is not always created equal. Since there are a myriad of programs available, MSI offers a choice of Operating Systems for use with your MSI Computer System. Of course, our favorite is MSIDOS, but we offer the powerful SDOS and FLEX operating systems as well. All MSI Systems will support the other software products associated with each operating system.

MSI also has a variety of software programs including a complete Accounting Package and a Multi-User Basic program capable of supporting up to four users.

MSI Systems are currently being used in a broad spectrum of personal, scientific, educational, professional, industrial control, and business situations. In addition to our Systems, MSI can supply you with individual components for personal and OEM use. All MSI System components are available, some in kit form.

Write or call us for more information about MSI Systems and products and the name of your nearest MSI dealer.

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